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# Electrical Review

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**Classified Advertisements—Official Notices—Tenders—Supp. 11.**

**Index to Advertisers—Page xl.**

## Principal Contents:

| | PAGE |
|---|---|
| Earls Court | 203 |
| Transformer Breathers. By R. R. Belbin | 207 |
| Magnetism in Industry. By A. Regnauld | 208 |
| An All-electric Organ. By C. McKechnie Jarvis | 209 |
| Protection by Extra Low Voltage | 210 |
| Ballroom Air Conditioning | 211 |
| Remarkable Expansion in South Africa | 212 |
| The Future of the Electric Vehicle. By Mac Armstrong and J. C. Owen | 213 |
| Correspondence: Gas Rings on Electric Cookers; Refusal to Supply; Labour and Distribution | 214 |
| Improving Lamp Efficiency | 215 |
| New Apparatus and Devices | 216 |
| Electricity Consumption in Industry | 217 |
| Adverse Factors at Southend | 217 |
| New Books | 218 |
| Business and Industrial Notes | 219 |
| Electricity Supply | 222 |
| Traction | 224 |
| Communications | 224 |
| Contract Information | 225 |
| Notes | 226 |
| Our Personal Column | 227 |
| Financial Section | 228 |
| Published Specifications | 231 |
| New Work for Contractors | 232 |

## Electricity Supply for Railways

THE Birkenhead Corporation has decided not to appeal further against the judgment given in favour of the Liverpool Corporation and the London, Midland & Scottish Railway Co., in the recent action and appeal in the matter of the supply of electricity to the electrified Wirral Railway.

As our readers will recall, the Minister of Transport made an order under Section 47 of the Electricity (Supply) Act, 1926, empowering Liverpool Corporation to supply electricity for this railway although it lies within the area for which the Birkenhead Corporation is the authorised undertaker. Birkenhead contested the order on the ground that the Wirral Railway was a separate system and not situated (as Section 47 requires) "partly within and partly without" the area of the Liverpool Corporation.

Mr. Justice Simonds held that the railway was an integral part of the L.M.S. system and thus the requirements of the Section were met and the Minister had powers to make the order.

Although acquiescing in the decision of the Courts Birkenhead is not satisfied with the position. The leader of the Council maintains that Liverpool have been guilty of an "unfriendly act" and behind the backs of the Birkenhead Council have undercut the grid tariff by "using their extraneous supply at Lister Drive."

In reply to this, the chairman of the Liverpool Electric Power & Lighting Committee points out that the supply will actually come from the Clarence Dock station which produces electricity at about the cheapest cost in Great Britain. On account of the efficiency of this station Liverpool is able to buy back its energy from the Central Electricity Board at the "independent operators'" price, *i.e.*, the price at which the undertaking could produce electricity itself had the 1926 Act not been passed.

Moreover, he asserts that actually Birkenhead benefits, through the grid, from the efficiency of Clarence Dock which enables the Central Board to buy energy for re-sale at a lower price than would otherwise be the case.

To the outsider these neighbourly exchanges mean little, for the fact remains that the conversion of our railways depends largely on the price at which they can obtain power. Just before the introduction of the 1926 Bill Sir Felix Pole, then general manager of the G.W.R., said that the governing factor in railway electrification was the cost of electrical power, irrespective of the ownership of the source of supply.

The Government, no doubt, had this in mind when accepting a new clause (eventually No. 47) moved by Viscount Churchill (another railway authority). Lt.-Col. Moore-Brabazon, speaking for the Government upon this addition, said in the House of Commons (ELEC. REV., Dec. 24th, 1926, p. 1032):—

> No one who looked at electricity from a national point of view could afford to neglect the railway load, which was a very big and very convenient one. It had a load factor of nearly 40 per cent., and it showed a diversity factor which still further benefited the station load factor. . . It was really to stop any future agitation by a railway company to put up a generating station that he asked the House to accept the new clause . . . the load of the railway companies would come to the undertakers of the country, which was only right.

It is evident, therefore, that the Government did not intend any "parochial" considerations to stand in the way of railway electrification. While we are not suggesting that the electrification of the Wirral Railway would not have been proceeded with if Birkenhead's price for electricity had had to be paid, there might easily be cases where the railway companies' decision hung by the thread of a small fraction of a penny per unit. In such an event an adverse decision would mean a dead loss to the supply industry—to say nothing of the passengers.

**Electric Vehicles**

IN the opinion of the writers of the article on "The Future of the Electric Vehicle" which appears on page 213 of this issue, "the time has arrived" when a special effort should be made to put electric vehicles in a supreme position among commercial vehicles of all types. How many times has the same thing been said about the electric vehicle generally? But the "time" has not only "arrived," it has also passed without much being done. We have, however, been advancing a little more rapidly during the last year or two, as the authors of the article show, for during 1936 the number of electric vehicles registered for the first time was 819, making the total in use in England, Scotland and Wales at December last 2,600. This presumably includes all classes of vehicles. The opinion is expressed that if electricity undertakings, backed by E.D.A., were to recognise that it is their legitimate duty to lend the full weight of their interest the future of the "electric" would be brilliant. E.D.A.'s propaganda effort of a year or two ago boosting the idea amongst bakers and dairy companies will still be in the minds of our readers.

**Good Examples Needed**

BY an interesting coincidence, just as this vehicle article claims attention, a letter reaches us from a correspondent who indicates that it requires more than the backing of E.D.A. to win municipal corporations over from the internal combustion engine. He sends us an advertisement from a daily newspaper illustrating part of a fleet of petrol vehicles supplied to the Birmingham Corporation. The letterpress relates to vehicles of a gross load on chassis of 3 tons 16 cwt., but the picture shows a couple of vehicles run by the Electricity Department. Our correspondent naturally thinks that so large and progressive an electricity undertaking should employ electrically propelled vehicles to run about advertising "Electricity: The Matchless Service"—matchless supposedly for all purposes save traction. He adds that the Corporation might advantageously send a responsible representative to Bournemouth "to study silent, efficient and fumeless transport."

**A Plea for Support**

IT might be inferred from a recent report by Mr. A. C. Johnson, borough electrical engineer of Southend (see page 217), that the electricity undertaking was in a parlous condition. That would certainly be a false conclusion, for the statistics of output and sales show excellent progress, and the load factor compares very well indeed with those of similar towns. Apparently, however, the distribution system has developed at a greater rate than the actual demand, and is not yet reasonably remunerative. But this is a policy which all progressive undertakings must pursue—a casting of bread upon the waters which, given an active sales policy encouraged by the local authority, must yield returns in due course. Mr. Johnson's complaint is that that encouragement is not as great as it might be, and he appeals for the Council's consideration. The specific matters mentioned in his report are not peculiar to Southend. They include excessive contributions to the rates, over-assessment for rating, and the neglect of the Corporation to give electricity full consideration when deciding upon the services for its housing estates. We trust that after studying the report the Corporation will come to a better realisation of its responsibilities towards its own undertaking.

**Progress in South Africa**

THE statistics of British electrical equipment exported to South Africa in the last two or three years have shown that electrical development in the Union has been advancing at a rapid rate. Confirmation of this is contained in the latest report of the South African Electricity Supply Commission which is reviewed on page 212. Including bulk supplies, the Commission's sale of energy during 1936 totalled about 1,688 million kWh—an advance of 50 per cent. over the 1935 figure. The mining industry appears to have been mainly responsible for this increase; the bulk of the power generated is used by the mines. Nevertheless, the direct supplies for lighting and domestic purposes rose by 42.3 per cent., while municipal supplies which are largely used for these purposes showed an increase of 13.6 per cent. The traction demand rises steadily, and was 7.9 per cent. greater than in 1935. The capital expenditure at the close of the year stood at £13,551,779, and works commenced last year have an estimated value of about £3,500,000.

**Experience for Demonstrators**

HOW many persons are there who, though fully trained in the theoretical side of their profession, fail to obtain situations through lack of practical experience. In the electrical industry, as in all others, this practical experience can only be provided by the industry itself. Bearing this fact in mind, the Training and Diploma Committee of the Electrical Association for Women, which has already done much to ameliorate the lot of the woman demonstrator, is now approaching all supply engineers in the country, suggesting that every showroom should accept one demonstrator fresh from college or polytechnic, and afford her six months' or a year's initial experience. This practice was advocated by Mr. Frank Forrest in his presidential address at the I.M.E.A. Convention at Brighton this year, and appears to have much to be said for it from all points of view. Not only would the demonstrator herself benefit, but the supply undertaking would possess an additional qualified member for the sales staff at a very reasonable cost. What happens to her when the initial period is completed must rest with the demonstrator herself, but it can safely be said that the scope for her activities is increasing.

**Appointments for Graduates**

THE shortage of skilled labour for certain branches of the electrical manufacturing industry which is the natural result of already full order books and the continued improvement in trade, is not likely to be relieved for some time to come. But it is not only the skilled worker who is in demand, for just now the young man who has successfully passed through his course of training at a technical college seems to have a better opportunity for making a start than has been the case in recent years. Telephone engineering is a constantly developing branch of the profession and industry and orders placed and in prospect are keeping companies in that line fully occupied. One of them has lately been advertising for men aged from twenty to twenty-seven years, who have been educated for electrical engineering and are prepared to join its staff for training as telephone engineers. Instrument and meter manufacture, inspection and testing, is another class of work where the business in hand should be creating favourable opportunities, especially in connection with specialised production under the defence scheme. The Appointments Board of the Imperial College of Science and Technology, which is doing its best to place graduates capable of taking up work in any branch of engineering, invites employers to make use of its services.

**Radio Set Prices Advance**

WITH the general rise in the cost of raw materials, and the need for quality maintenance, it is not surprising that the prices of radio sets are being increased. Fifteen radio set manufacturers have now announced advances amounting to approximately 5 per cent. on sets sold at over nine guineas. The companies concerned are Bush, Cossor, E. K. Cole, Ever-Ready, Ferranti, G.E.C., H.M.V., Invicta, Kolster-Brandes, Lissen, McMichael, Marconiphone, Pye, Ultra, and Philco. With the opening of Radiolympia, in less than a fortnight, it has been considered wise that the radio trade should be informed of these alterations before planning its campaign for the coming season. The subject is fully dealt with in *The Wireless and Electrical Trader* for August 7th.

# Electrical heating equipment in the new exhibition building

THE whole of the space heating of the new huge exhibition building at Earl's Court which has a volume of 47 million cu. ft., is effected by an electrode thermal-storage plant, the largest in existence within our knowledge, which operates in conjunction with a plenum system of heating and ventilation. To determine the heat-losses in such a building, with its tremendous variation of conditions, particularly during exhibition periods, and with hour-to-hour changes in the number of people present, is a difficult task. Calculations show, however, that 28,000,000,000 B.th.u. will be required for the space heating and ventilation and for warming the large swimming pool which holds 2¼ million gal. of water.

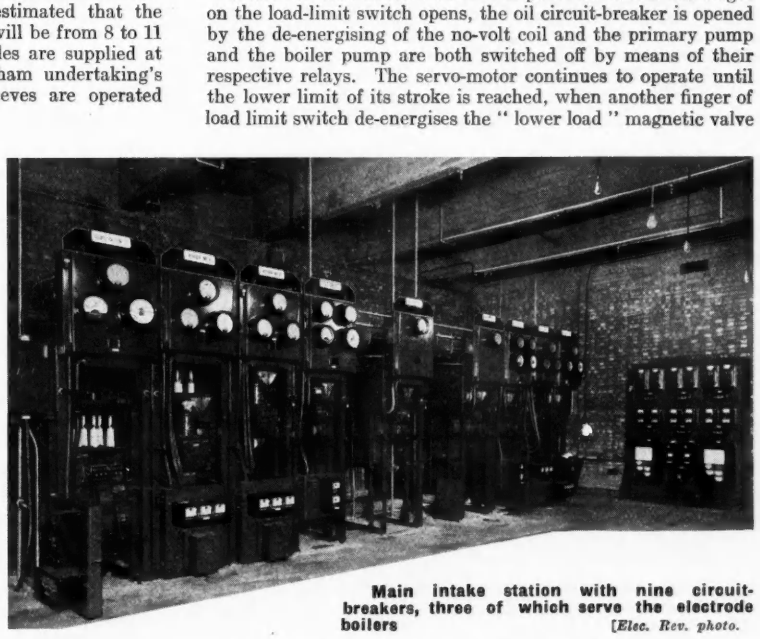
To meet this demand there are three 4,000-kW electrode boilers which operate in conjunction with seven large storage tanks, each about 11 ft. in diameter and 43 ft. long, having a total capacity of 170,000 gal. Due to the head of the water feed the temperature of the water stored in these tanks is 280 deg. F., and the outlet flow temperature is maintained at 180 deg. F. Under these conditions 34 million B.th.u. can be released during each of six consecutive hours, and 20 million B.th.u. during each of 15 consecutive hours. It is estimated that the total consumption for heating the building will be from 8 to 11 million kWh per year. The boiler electrodes are supplied at 11 kV by direct connection from the Fulham undertaking's intake station on site. The electrode sleeves are operated hydraulically.

For the simplification of description the operating cycle of one boiler only is detailed in the following notes. In addition to a control board in the boiler house there is another set of controls at the undertaking's central distribution point. It is assumed that the time switch is closed, the water in the system is below the required temperature, all protective devices are in the normal or "reset" position, the operator's hand switch at Fulham is closed, and that the boiler is set for the minimum load position. Then, when the operator at the boiler house closes the control switch, a relay closes two pairs of contacts, one of which, *via* a relay in the motor starter and contactor equipment, runs up the boiler pump, which merely circulates the water in the boiler itself. In similar manner, but *via* a selector switch, a set of auxiliary contacts then runs up one or other of the primary-pump motors which circulate the boiler water through the storage tanks. By spring-return test switches the boiler pump motor and the primary pump motor may be switched on at any time to check the operation of the motor-starting equipment.

When the primary pump is up to speed the closing contactor operates the main oil circuit-breaker by a solenoid. The closing contactor and the solenoid are then de-energised, but the circuit-breaker is held in by a no-volt coil. The second pair of contacts on the main control relay then operates the "raise load" magnetic valve of the servo-motor and the load is increased gradually until it reaches a point corresponding to the setting of the load control relay, and is then automatically held constant by this relay. With the hand switches, time switch and the protective devices in the same position, the boiler will remain in operation until the water flowing from it reaches the temperature for which the flow control thermostat is set. The action of this device is first to open a pair of contacts to prevent the load from being increased, and after a further slight rise in the flow temperature to close a pair of contacts to reduce the load. Reduction of the flow temperature naturally follows, and at the given point the flow control thermostat opens the last-mentioned contacts, so that control of the load is taken from the load control relay to the flow control thermostat. The boiler thus continues to operate at a reduced loading until the water in the entire storage system has reached the temperature for which the control thermostat is set.

This thermostat in the return main from the storage cylinders to the boilers then de-energises the control relay. This opens both pairs of contacts instantaneously, but does not cause the main oil circuit-breaker to open immediately, since the latter is held in by a finger of a load limit switch operated mechanically by the servo-motor. The second pair of contacts on the control relay energises the "lower load" magnetic valve and the load on the boiler is gradually reduced.

When the servo-motor reaches a point at which the finger on the load-limit switch opens, the oil circuit-breaker is opened by the de-energising of the no-volt coil and the primary pump and the boiler pump are both switched off by means of their respective relays. The servo-motor continues to operate until the lower limit of its stroke is reached, when another finger of load limit switch de-energises the "lower load" magnetic valve and a third finger is closed in readiness for the next start.



**Main intake station with nine circuit-breakers, three of which serve the electrode boilers** [*Elec. Rev. photo.*

The boiler then remains out of service until the control thermostat recloses as the result of lowering the temperature of the storage water when the complete cycle of operation is repeated. Opening the hand switch on the control panel or the time switch will de-energise the control relay and thus reduce the load and switch off in the same way as the control thermostat. Reclosing these switches starts the boiler up again without further attention. Control of the boiler load can be transferred from Earl's Court to Fulham. The time switch is then rendered inoperative, but the control thermostat and other operating and protective devices actuate as before. The boiler can be shut down instantaneously by a hand switch at Fulham.

The following protective devices are provided: A safety thermostat in the boiler which operates at excessive temperature; a combined overload and "unbalancing" relay which operates on excess current and in the event of the three phases becoming unbalanced; a terminal guard switch which ensures that the door in the guard around the h.p. terminals of the boiler remains closed while the boiler is in operation; a switch which operates on excess or insufficient boiler pressure; and an emergency trip switch on the control panel. When anyone of these protective devices operates the boiler and the pumps are switched off instantaneously.

The servo-motor is then operated in the "lower load" direction ready to restart, but the protective devices must be reset before the boiler can be switched on again. An alarm bell in the operating engineer's office indicates operation of any of the protective devices, and the position of the main circuit-breaker is indicated by lamps on the control panel. A special thermometer on the panel indicates the amount of heat stored in the system, while two indicating thermometers show the temperature of the water in the flow and return mains. The electrode boiler plant was designed and supplied by Bastian & Allen, Ltd.

## The Heating System

Secondary pumps for circulating hot water between the storage vessels and the heating system are hand-switched from the boiler-house control panel. The water in the storage vessels is not circulated directly through the building, because the water-temperature is too high, and mixing valves are provided for each of the various sections of the heating system, the water being circulated at a lower temperature and automatically controlled.

In the building space heating is effected in two ways—by heating the air during its passage through plenum ventilating plants and by radiation from hot-water pipes and radiators. Radiation is employed for such places as the offices and restaurants, while the plenum equipment, which is designed to pass 2,000 tons of air per hour, is devoted mainly to the principal halls of the buildings. There are 96 complete plants in the plenum system, with a total fan-motor capacity of 800 h.p.

**Gearless engine drives for passenger lifts** [*Elec. Rev. photo.*

Each of the plenum plants serves a definite section of the building, although in some cases it is more convenient to regard a group of the plants as serving a larger section of the building. For instance, eight plants are devoted to the main hall. Each of these passes into the hall 48,000 cu. ft. of air per minute and will raise the temperature from 32 deg. F. to 72 deg. F. with water at 165 deg. F. In each installation there is an extract which will pass 43,250 cu. ft. of air per minute, the difference in the volumes being accounted for by air losses.

For one of the side halls on the ground floor there are two plants with respective intake capacities of 28,000 cu. ft. per minute and 46,000 cu. ft. per minute, and one extract which passes 29,000 cu. ft. per minute. With water at 165 deg. F. the air temperature is raised from 32 deg. F. to 79/80 deg. F. For the other ground-floor side halls there are two plants with intake capacities of 26,000 and 44,000 cu. ft. per minute respectively, the air temperature conditions being 32 deg. F. to 72 deg. F. for the smaller plant and 32 deg. F. to 82 deg. F. for the larger. The two first-floor exhibition halls are served by 62,000-cu. ft. per min. and 53,000-cu. ft. per min. plants, respectively.

The hot-water supply to the heater batteries of each plenum plant is governed by motorised valves which are thermostatically controlled. There are two thermostats in the air duct and one in the actual section of the building served by the plant, and the "room" thermostat acts as a master to the others.

Some of the plenum plants are housed in the basement and some are in the roof. Some of them have heating and washing chambers incorporated in the actual building structure, while in other cases the chambers form part of the ducting system.

Further, some of the chambers embody dry air cleaners and some wet. In the case of a dry cleaner the air is passed through a filter consisting of a number of cells of expanded metal packed with steel wool. In a typical wet-cleaning plenum plant in the basement air is drawn into the chamber through an underground duct and passed first through the washer and then through two large heater batteries with gilled pipes served with water from the storage tanks. The cleaning water circulating in the washer is itself heated separately by a small radiator in the water tank served by a branch from the water mains from the storage tank. This supplementary heating is also thermostatically controlled and the idea is to avoid too great a drop in the air temperature due to the cold washing water. The air is drawn from the washer and discharged by the fan into the particular section of the building through ornamental grilles at the required temperature and velocity.

The double-inlet fan (in at either end and out at the top) is driven by a 35-h.p. motor, 970 r.p.m., *via* a "Texrope" reduction drive. A 1-h.p. motor drives the washing water circulating pump. Another plant in the basement fitted with a dry air cleaner has a 30-h.p., 965-r.p.m. motor, and it serves a section of the kitchens. In some parts of the building the air comes in through special nozzles, an outstanding example being nozzles of the eight plenum plants serving the main hall. They are situated immediately under the arena floodlighting gallery and are inclined at an angle so that the projected air from them all meets at the centre of the swimming pool below. Their special design renders the operation silent at the required high velocity of air flow.

Most of the extract fans are on the roof and the largest fan employed by the system is 12 ft. 7 in. high. For some of the major sections of the building and, in particular, the main hall, the air can be recirculated for reasons of economy. This is effected by means of pent houses with louvres in the "towers" which can be closed and opened at will. For recirculation, of course, the discharge is closed and the air is directed back into the intake channel and through the washing and heating plant at the foot of the pent chamber.

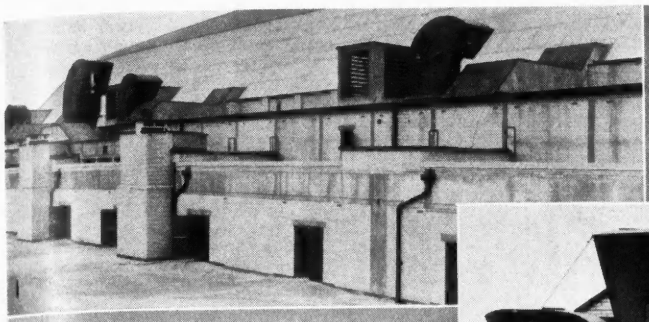
In the three main entrances of the building separate unit heaters are installed, each with its small heater battery and fan. They work independently of the main plenum system and their motors only are thermostatically controlled. The heating and ventilating system was designed and installed by the Norris Warming Co., Ltd.

## Lifts and Escalators

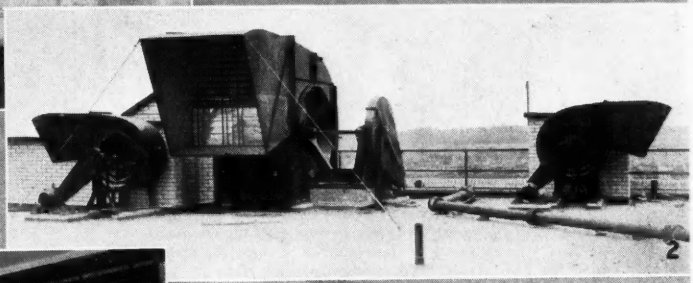
Throughout the building there are five passenger lifts, five goods lifts, three lorry lifts and a chair lift. Four of the passenger lifts, which are each designed for 20 persons and have cage speeds of 450 ft. p.m., with travels varying from 52 ft. to 79 ft. and serving from four to six landings, are driven by gearless motors with the "car-switch" variable-voltage Ward-Leonard system of control. The driving motors for two lifts with a 79-ft. travel are of 25 h.p. (64 r.p.m.). The fifth passenger lift accommodates 40 persons, has a cage speed of 176 ft. p.m., and a 44-ft. travel with four openings. The variable-voltage motor (38/45 h.p.) drives through a worm reduction gear and the control is similar to that of the other passenger lifts. In each case the car gate and landing door are electrically operated.

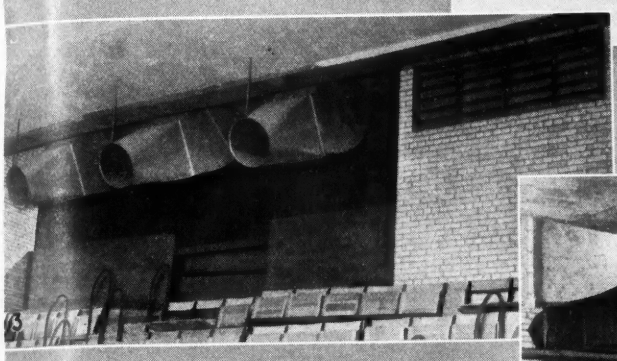
Each of the five goods lifts is designed to handle 3,000 lb., with a cage speed of 150 ft. p.m., and travels varying from 47 ft. with four landings to 76 ft. with five landings. In each case the slip-ring driving motor transmits *via* a worm reduction gear and the control is of the fully automatic push-button variable-voltage system. Lift No. 6, with a 47-ft. travel, has a 17-h.p. motor.

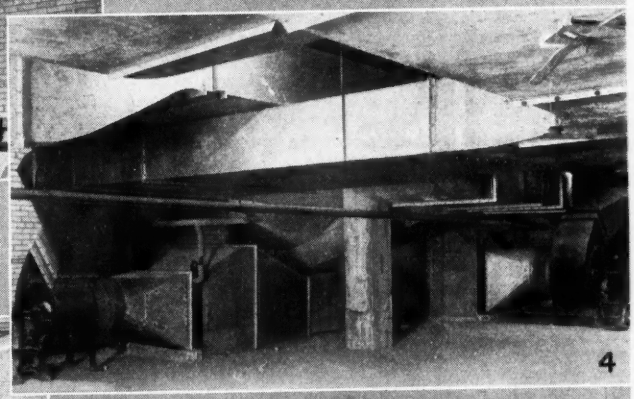
Each of the lorry lifts is capable of raising 9 tons at 30 ft. per minute, and in spite of this very heavy load levelling is effected very accurately. The cages are 10 ft. wide, 25 ft. deep and 15 ft. high, and apart from the hard-wood floors they are of all-steel construction. They are each suspended by eight steel-wire ropes. In each case the driving motor is

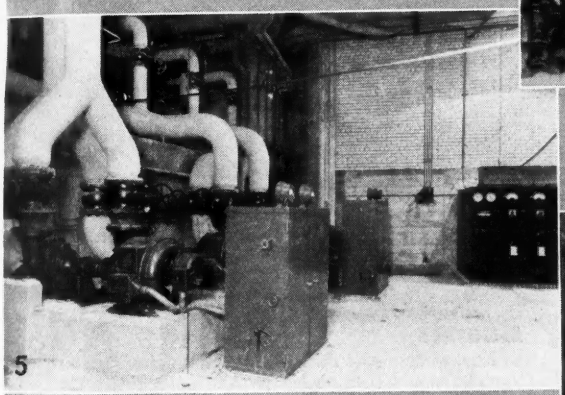


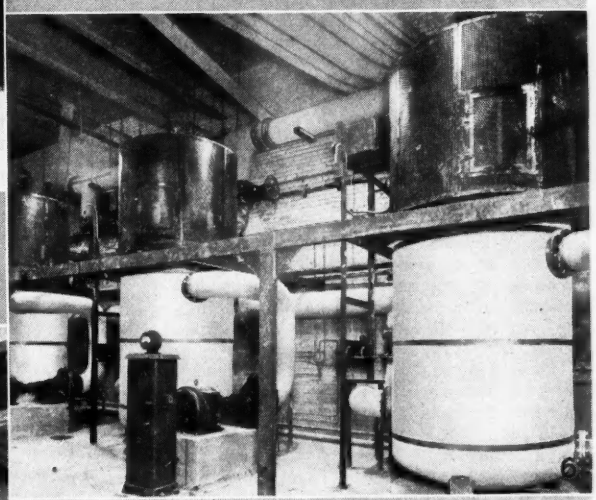
1. A row of pent-houses (for air circulation) and discharge points on the roof. 2. A group of extract fans situated on the roof. 3. A section of high-velocity nozzles for air inlet to the main arena, showing also an extract grille

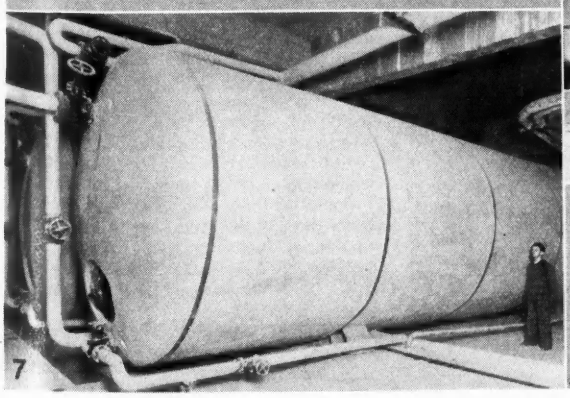


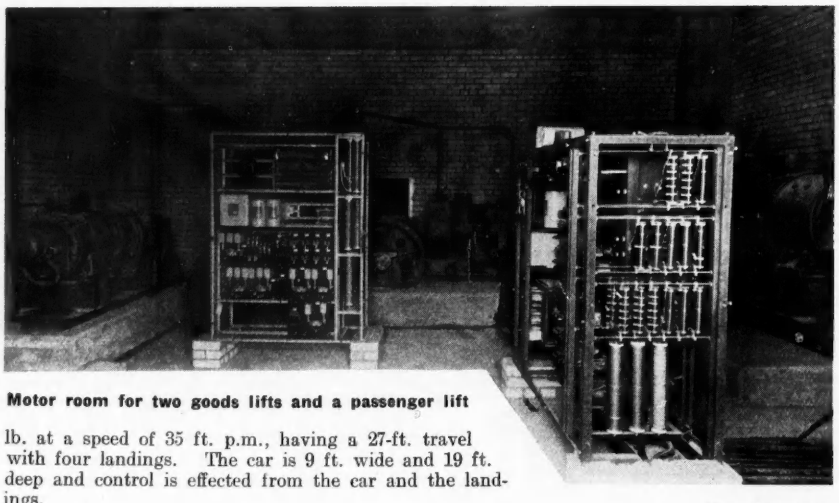



4. A group of self-contained plenum heating and ventilating plants. 5. Main boiler-to-storage tanks circulating pumps, mixing valves and main control board. 6. Three 4,000-kW, 11-kV electrode boilers with pumps and control gear. 7. A view of the 42,500-gal. thermal-storage tanks

[*Elec. Rev.* photos.

**Heating and ventilating plant at the new Earls Court**

an a.c. unit, with worm and spur reduction gearing. The "car switch" method of control is employed. The chair lift has been specially designed for its duties and it handles 6,000 lb. at a speed of 35 ft. p.m., having a 27-ft. travel with four landings. The car is 9 ft. wide and 19 ft. deep and control is effected from the car and the landings.



**Motor room for two goods lifts and a passenger lift**

Each of the six escalators has a capacity of 8,000 passengers per hour and the speed along the incline is 90 ft. p.m. The vertical rise varies from 32 ft. to 37½ ft., and in each case the escalator width is 4 ft. All the escalators serve the first floor, two being situated side by side in the main entrance in Warwick Road and one on each side of the swimming pool. The driving motors are of 46 h.p., 725 r.p.m.

A point of particular interest is the housing of the motors in concrete "boxes" suspended from the ground-floor ceiling. Access to the motors is through "traps" in the first floor. Under push-button control, the escalators can be run in either direction. In each case the steps are carried by about 550 rollers which are fitted with grease-sealed double ball bearings. The escalators and lifts were all supplied by the Express Lift Co., Ltd., and the motors and control gear are of General Electric Co. manufacture.

### Public Address Equipment

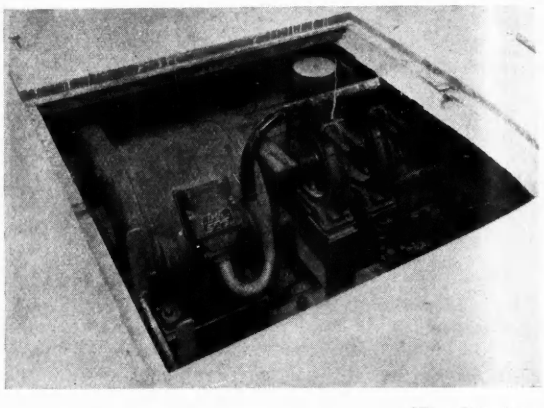
An extensive public address installation has a main amplifier consisting of six separate 90-W power stages for relaying speech or music to any part of the building from many microphone points. Any section of the building can be connected to any other section for public address purposes by electrical switching. The system was supplied by the Brighton and Preston Relay Station, Ltd.

Because of the long distances between the many public cloakrooms it has been found more economical to install individual self-contained water heaters than to supply the various hand basins, cleaners' sinks, foot baths, shower baths and slipper baths from a central equipment. Supplying the 340 water points there are over 100 heaters varying in size from 5 gal. to 80 gal. and representing a total load of over 260 kW. Practically all these water heaters are of Bastian & Allen manufacture.

While they are not electrical the unique rising platforms, which provide a covering for the swimming pool at exhibition times, are a notable piece of work by the Fraser & Chalmers works of the G.E.C. The platforms are independently operated by hydraulic power and they can be lowered into the pool so as to give depths of from 3 ft. 4 in. at one end to 13 ft. 4 in. at the other end. The swimming pool water is warmed by a large calorifier served by the thermal-storage plant and operated in conjunction with the Paterson water-conditioning installation.

*[Elec. Rev. photo.*

We are indebted to Major F. W. Yates, of Earls Court, Ltd., for giving us permission to view the building and to take the photographs which have been used to illustrate this article.



*[Elec. Rev. photo.*

**An escalator drive in its suspended housing taken from first floor**

## Insulating Boards

THE British Standards Institution has recently published two new standards. The first is No. 737, non-ignitable and self-extinguishing boards (with mineral bases) for electrical purposes which provides for four classes. Class 1 includes boards made generally of bonded asbestos fibre having a smooth finish, good mechanical properties, and withstands an electric arc in air, or a flame of high intensity, suitable for arc shields on control apparatus and the like.

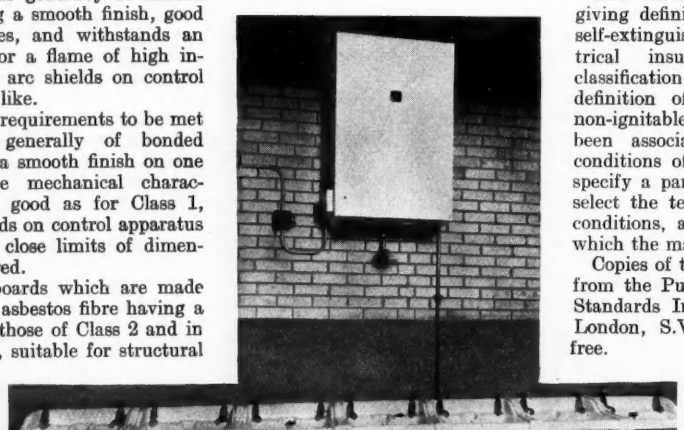
Class 2 covers the requirements to be met by boards made generally of bonded asbestos fibre, with a smooth finish on one side only, but the mechanical characteristics are not so good as for Class 1, suitable for arc shields on control apparatus and the like where close limits of dimensions are not required.

Class 3 includes boards which are made generally of bonded asbestos fibre having a rougher finish than those of Class 2 and in general more brittle, suitable for structural purposes and barriers in switches, cubicles and for similar applications.

Class 4 includes asbestos millboard and semi-flexible materials with a small percentage of binder; the material, although non-ignitable, has its physical properties affected by heat. The above classification is verified by tests laid down in the specification.

The second specification is No. 738, giving definitions of the non-ignitable and self-extinguishing properties of solid electrical insulating materials (including classification and methods of test). The definition of such terms as arc-resisting, non-ignitable and self-extinguishing, has been associated with certain prescribed conditions of test. A user who desires to specify a particular property will therefore select the test applicable to his working conditions, and prescribe certain limits to which the materials have to comply on test.

Copies of these standards can be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.



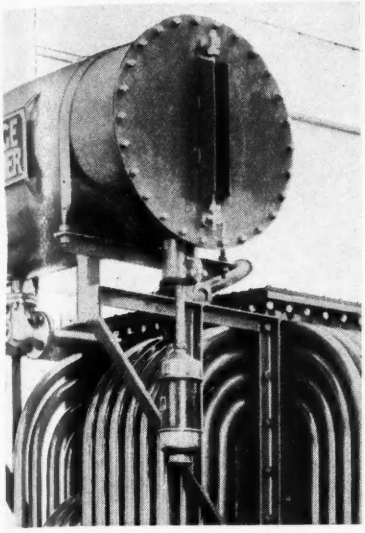
**One of the hundred lavatory water-heating installations at Earls Court**

*[Elec. Rev. photo.*

# Transformer Breathers. By R. R. Belbin

## Types and relative merits compared

TO allow for expansion, smaller transformers, reactors and similar plant which is oil-immersed, are provided with a tank which is slightly larger at the top than would otherwise be necessary. For the same purpose, larger plant is fitted with an auxiliary conservator tank, which is kept half full so that oil may flow into it by displacement from the main tank when the latter's temperature rises. Air is thus expelled from the conservator and re-enters when the surplus oil returns to the main tank after the latter has cooled.



Silica gel breather fitted to conservator of Hackbridge transformer

This "breathing" action makes it desirable for the air admitted to be dry; for, although oil is non-hygroscopic, the effect of its exposure to moisture-laden air is to lower the dielectric strength of the oil. The conservator tank also serves another purpose—that of exposing as little as possible surface area of oil to air, so minimising the sludging that tends to occur in the presence of oxygen.

Monthly inspection may have to be considered in some instances, but generally three months is adequate where breathers of the calcium type are fitted with oil seals. The ideal breather which would never require regeneration has not yet been discovered.

The use of calcium chloride as the drying agent is extensive, but so far as adsorbtion power is concerned silica gel is far superior. It does not need to be so frequently regenerated or changed and, better still, a smaller capacity unit suffices.

### Advantages of Silica Gel

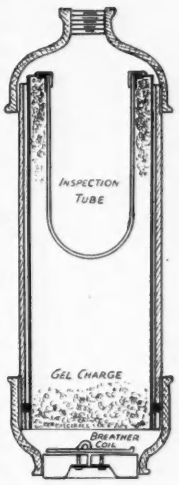
Both agents are capable of regeneration, but whereas $CaCl_2$ disintegrates to a great extent, silica gel remains in its original state. It is only necessary to drive out the moisture from its numerous pores, after which it is capable of further use and can be regenerated over and over again. Calcium, on the other hand, powders up and when moisture contaminated may form a paste which will clog, be corrosive in its action and extremely messy to handle. Water contaminated calcium chloride will produce traces of hydrochloric acid. In one particular type in which wire gauze was used to keep the calcium in position the gauze was found to have completely disintegrated and the calcium to have formed a thick paste through which it was impossible for air to pass.

The breathers shown in the various sketches are typical of those fitted to large transformers and oil-immersed reactors. The silica gel type differs somewhat in construction and is as near the ideal as any yet on the market.

### A Colour Test

Silicia gel is an extremely porous substance and is claimed to be capable of adsorbing 40 to 50 per cent. of its weight of water from saturated air. For dehydration purposes the granular form is used and one cubic inch of this material has an internal surface of over one acre. When used for breathers it is impregnated with cobalt chloride, which when dry and in the active state is of a deep blue colour, but changes to a whitish pink when saturated with moisture.

In this way it is possible to observe through the glass inspection tube the state of the charge. When the colour change is nearing the top an active charge should be put in, the spent one being reactivated or dried by putting the complete inner container in an oven and heating it to a temperature of 300 to 400 deg. F. until the blue colour returns. When this condition is reached, and while it is still warm, the lids provided should be replaced and sealed with adhesive tape. This charge may now be stored ready for the next change.

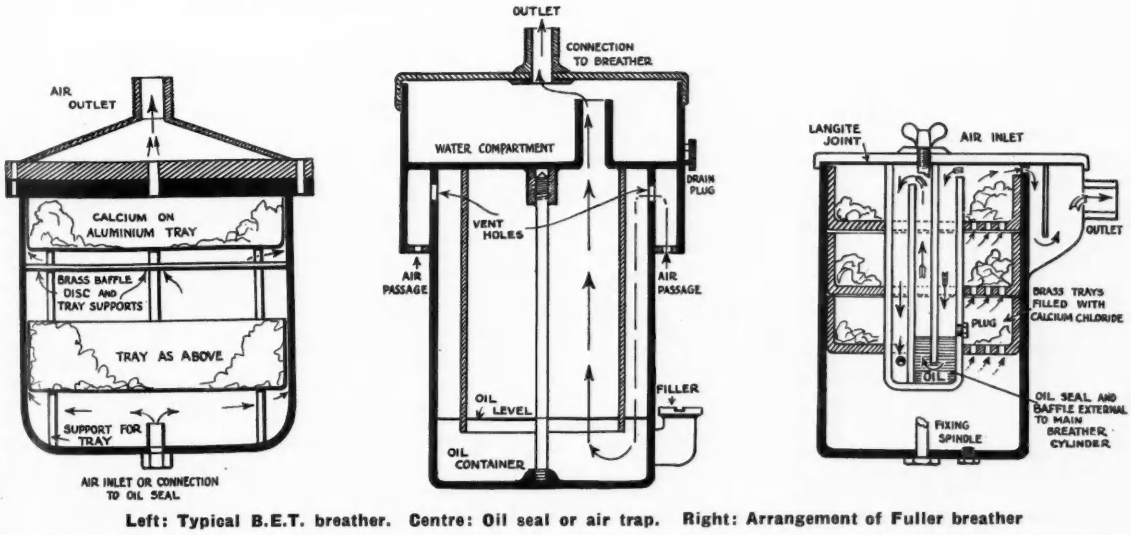



Silica gel transformer breather

The breather coil consists of two turns, protected at the open end by fine mesh copper gauze to prevent insects from entering. This coil effectively prevents diffusion of moisture into the gel, when no breathing is taking place. The breather is made in a range of sizes capable of dealing with 1 cu. ft. per 24 hours to 16 cu. ft. per 24 hours for a period of twelve months. It is less liable to corrosion and is very neat in design. As the breather charge lasts considerablly longer in the active state, this type is particularly suitable for apparatus situated in remote districts where inspection cannot be carried out as frequently as might be desired.

### The Oil Seal

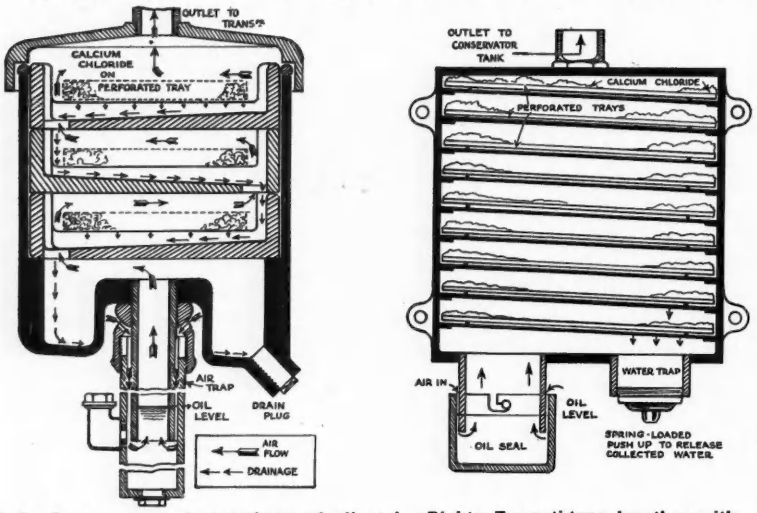
In one of the illustrations reference is made to a connection for an oil seal, which may be fitted to any breather and is shown in section separately. By providing an oil seal, or air trap, the effective life of the dehydrating agent is increased, as compared with cases in which the contents of a breather are open to atmosphere. This fact is borne out in practical experience. Its effect is to preclude free moisture from entering the breather and leave the dehydrating medium free to deal only with the water vapour which is present in the atmosphere.




**Left: Typical B.E.T. breather. Centre: Oil seal or air trap. Right: Arrangement of Fuller breather**

This is accomplished by the entering air having to bubble through the oil before reaching the breather.

Regarding the prices of the various types, there is little difference between them, as this is generally standardised between the various manufacturers. At any rate the cost is negligible, as compared with the cost of the main apparatus to which they are fitted.




**Left: Calcium chloride breather and oil seal. Right: Ferranti-type breather with incorporated oil seal**

Maintenance is another proposition. The calcium types normally require more frequent inspection and renewal of the drying agent. The cost of granular calcium chloride is admittedly comparatively low and the amount used small, depending on the size of breather. On the other hand, the silica gel type requires no actual renewal of the drying medium. Offset against this, of course, is the cost of reactivating the spent charge. This may be considered negligible, as some type of drying oven is usually available in most works laboratories or factory shops.

The drying operation may be carried out while the oven is in use for some other purpose, thus avoiding the cost of heating up the oven specially for reactivating the silica.

One spare only need be carried, using the one taken out after reactivating as the charge for the next and so on. Even in outlying areas the routine can be so arranged as to make this possible.

Finally, to sum up, breathers of the silica gel pattern may be said to possess advantages in respect of appearance and general convenience of inspection, duration of active state, and rapidity with which charge-replacement may be effected.

# Magnetism in Industry.

## By A. Regnauld, B.Sc., M.I.E.E.

EVERY electrical engineer will recall having to listen during his student days to rather uninteresting lectures on magnetism, and the text-books on electrotechnology likewise devote one or two chapters to this same subject. But apart from that, except that they realise the fundamental importance of the magnetic field in an electric generator or motor, and perhaps occasionally meet with a solenoid used in the operation of a relay, the majority of electrical engineers are inclined to think that the force of magnetism, as such, is of little industrial importance.

Actually, however, the reverse is the case, and recent developments have shown that the force of magnetism—either as obtained from permanent magnets or in the more easily controlled form of electro-magnets—is becoming of greater and greater importance to the engineer. Most engineers are aware of the fact that electro-magnets are used for lifting iron and steel in the foundry, the shipyard, and so on, although it is not usually realised how important a form of lifting tackle the magnet has become, or to how great an extent it is used in industry.

Again, the force of magnetism is made to operate a very simple, but extremely convenient, form of chuck for all manner of machining processes, work of the most complex shape being held in position without any risk of damage due to clamps or holding-down bolts. And since d.c. is not always available, one enterprising British firm—James Neill & Co. (Sheffield), Ltd.—has actually produced a permanent magnet clutch, in which the magnetic force is applied or released by the ingenious device of moving the magnets beneath a face plate composed of bars of high permeability steel embedded in a non-magnetic ferrous alloy.

It is apparent that if the force of magnetism can be employed for lifting purposes and for holding down against the effects of machining, it should be possible to use it in the form of a brake. The magnetic brake has for a long time been employed in electric traction systems, but it is only within recent years that magnetism has been directly employed to any extent in brakes for preventing the over-running of cranes, winches, and so on. Messrs. Laurence, Scott & Electomotors, Ltd., have incorporated in their winch motors an ingenious form of magnetic brake, consisting of a number of discs carried on the shaft, alternating with stationary discs secured to the casing. The latter, which are provided with friction lining, are pressed against the surfaces of the steel discs on the shaft by a system of springs. The magnetic force operates against the springs, thereby enabling the shaft to run freely so that when the current is cut off, (or should it fail from any cause) the brake is automatically applied.

Another recent application of the force of magnetism is to yield a flexible coupling between a Diesel engine and the pinion of the gearing on the propeller-shaft of a ship. Couplings of this type, which is known as the Asea electro-magnetic slip coupling, have recently been fitted on a Swedish motor ship of 1,250 tons deadweight. It is of particular interest to marine engineers in that it provides a complete solution to the difficult problem of utilising toothed gearing for reducing the speed of rotation between the Diesel engine, with its cyclic fluctuation of torque, and the propeller-shaft.

The coupling comprises an inner multi-polar magnet ring mounted on the pinion shaft of the gearing and excited by d.c. through two slip rings and an outer ring provided with a short-circuited winding which is carried by the engine shaft. When the magnet ring is excited the lines of force passing across the air gap, which is about $\frac{3}{8}$ in. wide, induces currents in the winding carried by the engine shaft in much the same way as in a squirrel cage motor and the resistance to relative movement effects the transmission of torque between the two. Engaging and disengaging the coupling is effected by closing and opening the excitation current circuit and it is stated that the gearwheel shaft follows the engine with a difference of speed of only 1 to 2 per cent., which is sufficient to form an effective protection for the gearing against shocks due to speed fluctuations.

It may be noted that in the ship in question there are two engines, each of about 700 b.h.p., and two electro-magnetic slip couplings which drive two pinions gearing with a common gear wheel mounted on the single propeller-shaft and giving a speed reduction of 300 r.p.m. at the engines to 130 r.p.m. at the propeller. This form of coupling should have many applications where a geared Diesel engine drive is desired.

### Steam Storage for Peak Loads

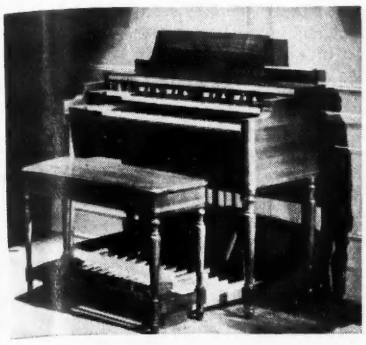
Among the papers read at the recent congress of the Union Internationale de Tramways, &c., one by Herr Franz Stipernitz, the engineer of the Vienna municipal electricity undertaking, in which he described the high-pressure steam storage plant to meet momentary peak loads which is in use at the Simmering power station near that city. Formerly a wait of two minutes was found necessary from the lighting of the oil-fired burners under the stand-by boilers until full steam output was available, and it was decided that some form of steam accumulator was necessary to bridge this interval.

The installation consists of eight horizontal cylinders of heavy forged steel situated in the boiler room of the station. The cylinders, which are about 29 ft. long and 4 ft. in diameter, are filled with hot water and charged with steam from a small oil-fired forced-circulation boiler capable of raising the pressure in the accumulator to 1,700 lb. per sq. in. The regular operating pressure is, however, 500 lb. per sq. in. Six of the cylinders act as steam accumulators, discharging through a pressure control valve which maintains the supply to the station's steam main at 500 lb. Saturated steam at 1,700 lb. per sq. in. becomes quite wet when throttled to 500 lb. Hence some provision had to be made for drying and superheating the steam, this being accomplished in the two upper cylinders. No difficulty is expected from the use of saturated or slightly superheated steam at 500 lb. per sq. in. in the stand-by turbines, although the normal operating temperature is 750 deg. F. The plant at the Simmering station normally comprises turbines totalling 20,000 kW.

# An All-electric Organ.

By C. McKechnie Jarvis, A.M.I.E.E.

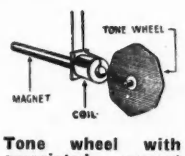
IT is well known that of the wide range of vibrations which it is possible to generate, the human ear can detect the pitch of only that part which falls within the frequencies of 20-4,000 cycles per second, varying, of course, with individuals. All musical instruments generate a fundamental frequency each time a note is sounded and, in addition, a number of overtones, harmonics or partials depending upon the instrument. Thus the difference between a note (say upper C) played on a flute and on a violin lies in the intensity and degree of the harmonics present.



**Console of the Hammond organ**

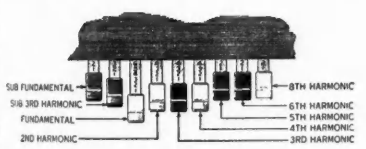
The Hammond pipeless organ is a tone synthesiser capable of generating a series of sinusoidal waves which can be modulated at will by the addition of harmonics, so that the resultant output from the sound cabinet can be matched to orchestral instruments or contrasted with them. The equipment consists of a console with two keyboards and a set of detachable organ pedals, expression or swell control pedal, and a separate sound cabinet. The console contains the generator assembly driven by a synchronous motor; drawbars for selecting the harmonics required and for regulating their intensity; a mixing circuit; volume and tremulant effect controls; and a pre-amplifier.

The sound wave is generated as a minute electrical alternation in the "pick up" or stator coils of each of the 91 tone generators provided. In each tone wheel and its associated magnet assembly flux is derived from a circular permanent magnet over which the coil is slipped. The strength of these magnets is carefully adjusted so that they are commercially identical in performance. The magnets are carried in a steel frame, which is sub-divided into a number of cubicles, so that the magnetic circuit is practically unbroken except for the air gap between magnet tip and tone wheel, which is adjustable. The steel tone wheels are carried on a steel shaft sectionalised for stability and to minimise flux leakage.




**Tone wheel with associated magnet assembly**

So sensitive is the instrument that numerous precautions are taken at every stage in the design to neutralise the effect of stray fields, which would cause distortion and poor tone quality. Thus the wheels are grouped according to frequencies and their multiples for this reason.



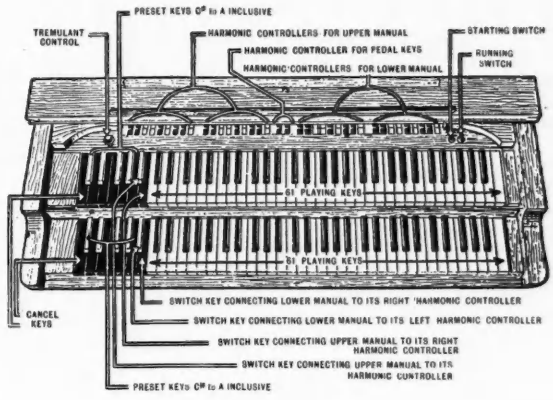

**Harmonic controller**

Mechanical stability has first to be considered and means provided to completely neutralise any tendency of the small synchronous motor to hunt, as well as to counteract its natural and inherent pulsation as it jumps from pole to pole. The inventor has ingeniously made use of the stored energy in the discs (which may be considered as small flywheels) and by a special system of couplings, by which they are attached to the shaft, has ensured uniform rotation.

Each tone generator is provided with a small resonant filter circuit, consisting of a centre-tapped iron-cored choke, with or without a condenser (except for the very low frequencies, in which case a centre-tapped resistance is substituted), the mid point of each being earthed. The generator circuits are normally open, but when a key or pedal is depressed a series of circuits is established *via* the drawbars of the harmonic controllers or preset keys.

Each harmonic controller is coupled to the mixing circuit where the impulses are merged according to their preselected intensities. The harmonic controllers are mounted above the keyboards and at the left-hand end the makers have provided an octave of reverse coloured keys. The first of these, situated on the extreme left, is a "cancel" key to release any preset keys which may have been depressed. The following nine are "preset" keys which remain down when depressed, until released by pressing another or by the "cancel" key.

The purpose of the preset keys is to provide a series of "ready made" tonal combinations corresponding to the arrangement of thumb pistons, or combination pedals on a pipe organ. Thus the preset keys may be set up to give individual instrumental tones (oboe, flute, piccolo, solo violin, French horn, trumpet, etc.) or the tones of organ stops (diapason, lieblich, gamba, principal, tibia, etc.), orchestral combinations (soft strings, flutes and strings, oboe and flute, wood-wind) or an organ ensemble, for instance, "soft swell,"


PRESET KEYS C⁰ to A INCLUSIVE
TREMULANT CONTROL
HARMONIC CONTROLLERS FOR UPPER MANUAL
HARMONIC CONTROLLER FOR PEDAL KEYS
HARMONIC CONTROLLERS FOR LOWER MANUAL
STARTING SWITCH
RUNNING SWITCH
61 PLAYING KEYS
61 PLAYING KEYS
CANCEL KEYS
SWITCH KEY CONNECTING LOWER MANUAL TO ITS RIGHT HARMONIC CONTROLLER
SWITCH KEY CONNECTING LOWER MANUAL TO ITS LEFT HARMONIC CONTROLLER
SWITCH KEY CONNECTING UPPER MANUAL TO ITS RIGHT HARMONIC CONTROLLER
SWITCH KEY CONNECTING UPPER MANUAL TO ITS HARMONIC CONTROLLER
PRESET KEYS C⁰ to A INCLUSIVE

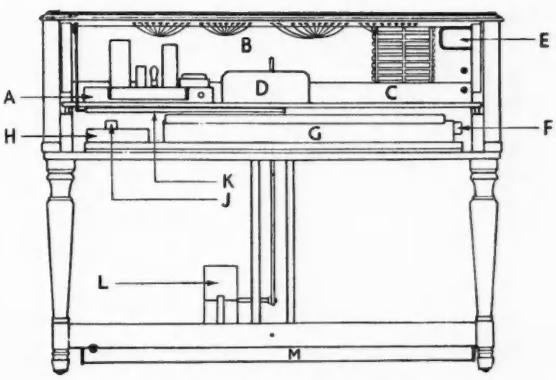
**Plan of console**

"full swell," "great to 15th," "full great" and "diapason chorus."

In all, eighteen different combinations (which can be set up to suit individual requirements) are available on the preset keys without the necessity of touching the harmonic controllers. Apart from the preset keys, each keyboard has two harmonic controllers, either of which can be switched into circuit by the remaining two reverse coloured keys, so that four further combinations may be set up and drawn upon as required. The arrangement of selectors is such that the preset keys and harmonic controllers, which are in parallel, are not in circuit at the same time.

After leaving the mixing transformer the signal is fed into the pre-amplifier through a circuit containing stabilising resistances and condensers, swell pedal rheostat and tremulant control. The swell pedal rheostat is a multi-contact switch with resistances, connected to bypass to a varying degree (depending upon the position of the swell pedal) the pre-amplifier input. Its volume range is enormous, the power ratio figure given by the makers being 50 decibels from "fully open" to "fully closed."

The tremulant effect is controlled by a knob on the keyboard which varies from zero to the maximum, the value of a carbon resistance in series with the input to the pre-amplifier. Across this resistance is tapped a bank of other resistances connected




**Rear view of console with back removed**

A. Pre-amplifier. B. Upper manual. C. Lower manual. D. Rheostat and terminal box. E. Matching transformer. F. Starting motor. G. Chorus generator. H. Power terminal panel. J. Synchronous motor. K. Switch. L. Swell pedal. M. Pedal switch.

to a cam-operated switch coupled to the synchronous driving motor. The switch contacts open and close in succession and constitute a variable resistance shunt for the carbon resistance in the line. The effect is that of producing a pulsation of input current to the pre-amplifiers under the discrimination of the

performer who can adjust his tremulant control to give the degree of "tremolo" required.

The rear view of the console (cover removed) indicates the relative positions of the components. The chorus generator shown near the bottom of the upper compartment is a useful feature of certain models. It is an additional generator unit with a double set of tone wheels, one set being of slightly higher and the other of slightly lower frequency, than the corresponding fundamental. The chorus generator is provided with a multi-contact switch which connects each unit in parallel with its fundamental tone generator, when the "chorus" drawbar on the manual is operated. The musical effect is to broaden the sound wave, so producing the rich "celeste" well known to organists.

The pedal notes are derived from the manual generators and the harmonic content is regulated by two drawbar selectors in the centre above the keyboards. The pedal output is united with that of the manuals in the mixer circuit and the combination passes through the pre-amplifier as a common signal. The pre-amplifier delivers the total organ output, which is still in the form of electrical impulses, to the power amplifier in the sound cabinet *via* a special screened interconnection cable, and here it is amplified and passed to moving coil speakers.

Certain features of the construction are of special interest. The contacts throughout are of platino-iridium alloy and means are provided for cleaning the contact faces without dismantling the instrument. The whole of the interior is "sprung" and metal parts are earthed in several places. Lubrication is arranged for from a central reservoir and all generator bearings are wick fed. The organ is constructed from a series of unit components, all easily removable. The wires and resistances used are "colour coded" for rapid identification.

It may be of interest to contrast the Hammond organ with another electric organ which was built by Dr. Thaddeus Cahill in New York in 1906. Dr. Cahill used 144 separate inductor disc alternators driven by a 185-h.p. d.c. motor (actual load about 10 h.p.). As valve amplifiers were not available, the alternators had to be capable of producing all the energy required for distribution to the various receiving instruments.

A number of mixing and filtering transformers were employed, weighing several hundred pounds each, and the weight of the whole equipment amounted to 200 tons. After several years of experiment, a music diffusion service from a central generating station in Broadway, New York, was established over a network of wires belonging to the Eastern Cahill Telharmonic Co. The music was sent over land lines from the generating station, *via* the keyboard, to subscribers' homes where paper cone loud speakers were provided.

The Hammond organ console weighs only 350 lb. with pedal clavier and bench and is driven by a 10-W synchronous motor. The total power consumption for the smallest model suitable for home use and in small churches is 200 W, the speakers having an output of 20 W. Models with larger cabinets (40 W output, 400 W total consumption) are available and any number of additional sound cabinets may be employed. For cinema use the preset keys would, of course, be set rather differently from those for church use, and such effects as xylophone, chimes, harp, etc., are available.

The instrument is extremely well designed and the inventor ingeniously employs modern radio technique to good advantage. The organs are now being manufactured from imported components, by the sole British distributors, Messrs. Hoosey and Hawkes to whom I am indebted for the information upon which this article is based.

# Protection by Extra Low Voltage

IN the course of notes in *La Technique Moderne* on points of ambiguity and causes of practical difficulty in complying with the French decree of August 4th, 1935, concerning the protection of workers where electricity is used, M. G. Lacroix refers to special problems associated with the use of extra low voltages, below the limit of danger. According to the decree, the limits of *très basse tension* are 50 V d.c. and 24 V single-phase a.c. In 3-phase circuits the maximum voltages above earth must not exceed 24 V; hence the voltage between phases is restricted to 24 V if the neutral is not earthed, and to $24\sqrt{3}$ or 42 V if neutral is earthed. The stated voltages are limiting values above which it is considered there is danger to life from accidental contact with a live conductor. The use of lower voltages, wherever practicable, increases the margin of safety.

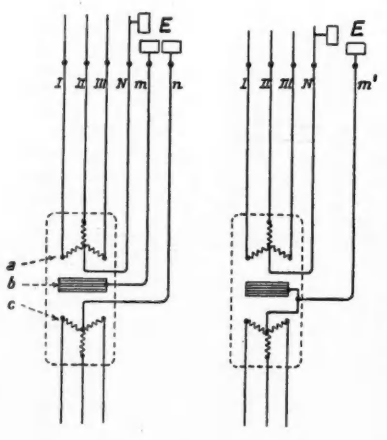



**Diagram showing earth connections**

As regards a.c. supply, which is nearly always concerned, the decree requires that the extra-low voltage shall be provided by double-wound transformers, *not* resistances or auto-transformers. The technical commentary on the decree says that the insulation between the windings must be particularly good, leaving it to the Union des Syndicats de l'Electricité to determine the appropriate test voltages. An earthed metal screen between the windings is a good precaution, and transformers for use in damp situations should be suitably impregnated.

An important point, not settled by the decree, arises from the relatively wide regulation of small transformers, particularly those capable of withstanding short-circuit of their secondary winding. The open-circuit voltage of such transformers is considerably higher than the voltage on load, and if the latter be 24 V, the question arises whether the transformer complies with the decree, its open-circuit voltage being substantially higher than 24 V. M. Lacroix considers that the transformer may still be regarded as safe because "the voltages mentioned in the decree are distribution voltages, *i.e.*, mean voltages on load, and do not take account of accidental variations due to changes of load; also, operation on open-circuit is accidental and of short duration." However this may be, the posibility of danger or of trouble with inspectors can be avoided by using a normal voltage of 12 V (which is, in any case, desirable on general grounds), the open-circuit voltage being then certainly within the limit of safety.

The decree places no restriction on the primary voltage, except that portable transformers must be fed with current of category 1(b1) (a.c. not exceeding 150 V r.m.s.). In practice, the majority of safety transformers are designed for "first category" supply (not exceeding 250 V), and only rarely for "second category" supply.*

Practical difficulties arise in complying with the earthing requirements of the decree. If the transformer is supplied at high-voltage, or if it is to be used in damp situations, its frame must be earthed, requiring a supplementary conductor *m* (see fig.). Again, if the secondary is wound for 42 V, the neutral of the secondary must be earthed by a special conductor *n*; and, if the primary is star connected, its neutral must be connected to the earthed neutral of the network by a third conductor *N*. According to Article 9 of the decree, says M. Lacroix, the three earth connections *N*, *m*, *n* should be distinct, but as this is impracticable, two connections are combined. The arrangement recommended is with the frame of the transformer and the neutral of the secondary connected to a single earth *m'* (right-hand diagram). The other alternative, connecting *N* and *m*, would impose on the transformer frame any displacement of potential at the primary neutral resulting from earth faults on the primary phases.

In the case of a portable transformer, a 5-pin plug is required to effect the connections, *I*, *II*, *III*, *N*, *m'*, and the *N* and *m'* pins must be longer than the others in order to complete the neutral and frame earth connections before the phase connections, as required by the decree. The lead *N* can be laid with *I*, *II* and *III* in a single cable, but conductor *m'* forms part of the extra-low voltage network and must therefore not be laid up with the others (Article 3). The use of a 4-core and a single-core cable between the 5-pin plug and the transformer is inconvenient and introduces serious risks of entanglement and breakage. A more practicable means of effecting the earth connections is therefore sought.

* In the annual returns issued by the Ministry of Public Works concerning electricity supply in France the distribution "categories" are given thus: (1) low voltage (*a*) d.c. not exceeding 600 V, (b1) a.c. not exceeding 150 V r.m.s., (b2) a.c. 150-250 V r.m.s.; (2) high-voltage; (3) extra-high-voltage, over 60 kV d.c or 33 kV a.c., between conductor and earth.

# Ballroom Air Conditioning

## Large "Freon" plant driven by silent motors

WHAT is now known as the Great Room at Grosvenor House, Park Lane, was originally built and used as an ice skating rink, but was converted some years ago into a combined ballroom and banqueting hall, and has since been used for those purposes. It is probably the largest of its kind available for this sort of function, being capable of accommodating over 1,500 guests without overcrowding.

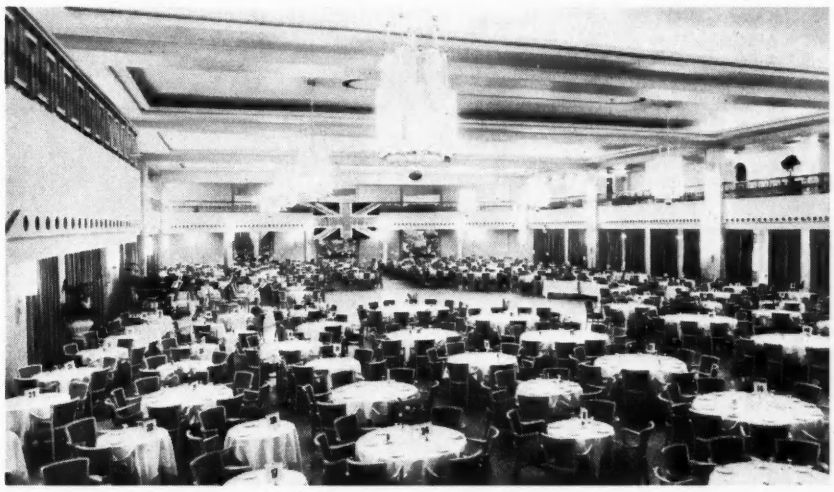
The room has a capacity of almost one million cubic feet and was until recently served by ventilating plant which, owing to the amount of heat given off by the occupants and the lighting installation, became unable to maintain a comfortable atmospheric condition under the changed state after the conversion.

In order to overcome this difficulty and to ensure the provision of a clean and comfortably cool atmosphere a new air-conditioning system was substituted during the early part of this year, as mentioned by the president on the occasion of the last I.E.E. annual banquet in the Great Room.

The installation is noteworthy because the cooling of the water which is utilised for lowering the temperature of the ventilating air is effected by means of a "York" "Freon" system of 200 tons capacity. This refrigerant (dichloro-diffuoro-methane) is non-toxic, odourless, non-irritant and non-inflammable, and therefore well suited to air-conditioning work in public buildings, where a leak from a refrigerating plant using a toxic gas would be very unpleasant and possibly harmful.

From the water-cooling system chilled water is pumped through 7-in. pipes to a mixing tank, which is an integral part of a dehumidifier wherein the conditioning of the air takes place. Adjacent to the dehumidifier are fitted filters for cleaning the incoming air, pre- and main steam heaters and the necessary automatic controls to ensure that the room will be kept at the desired condition.

As the functions held in the Great Room are many and varied, it was essential to install controls of such sensitivity as would enable arrangements to be made whereby when a dance is in progress and more moisture than usual is being evaporated into the room from the people the air can be supplied at a correspondingly lower humidity. The air is drawn through the dehumidifier from the room itself, and also from the outside, by a large circulating fan and supplied through a range of steel ducts, the largest of these being 14 ft. wide.



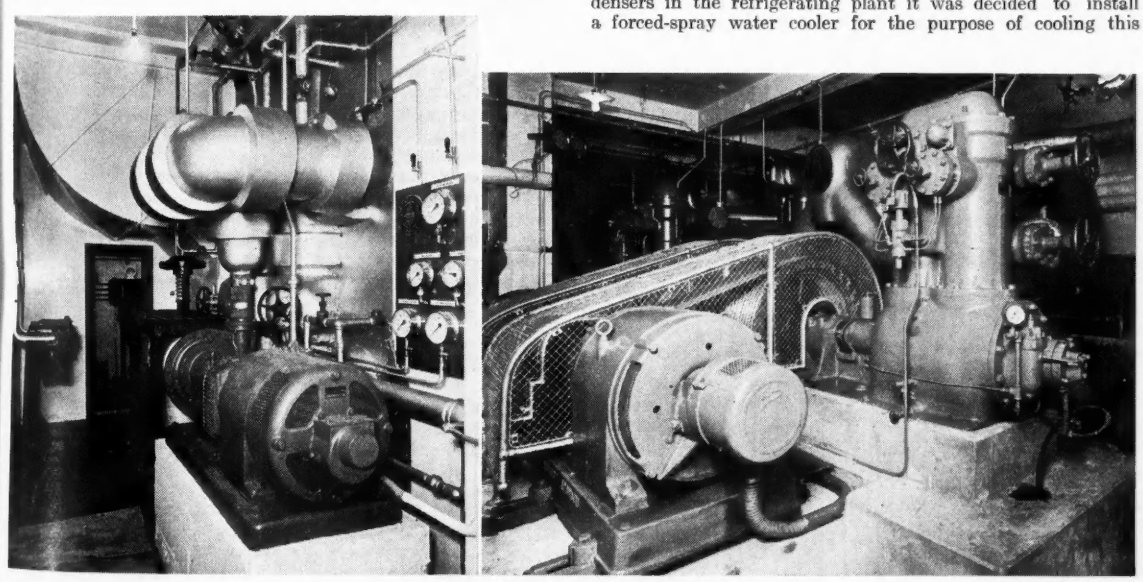
The Great Room at Grosvenor House

The design and installation of these air ducts presented the greatest problem in the installation as it was essential that the normal working of the hall should be undisturbed and no interference made with any of the functions. It would have been ideal from an engineer's point of view to close the room entirely during the installation, but this, of course, was by no means desirable, particularly during Coronation year, when the booking of functions was very heavy indeed. A very comprehensive schedule was drawn up whereby part of the room was taken at a time and screened off from the remainder. Behind the screen workmen were engaged in taking down the false ceilings, removing the former ventilating ductwork, fixing the new and larger ductwork for the air-conditioning plant, and, finally, replacing the false ceilings and handing the space over to the banqueting department of the hotel.

It was, of course, necessary to so arrange the banquets that the part of the room being dealt with was not used, and very close adherence to the scheduled dates was necessary as otherwise the working of the banqueting department would have been very badly affected. In this manner the complete range of ductwork was installed section by section, while the refrigerating plant, fans and dehumidifier were being erected "behind the scenes."

Owing to the large amount of water required for the condensers in the refrigerating plant it was decided to install a forced-spray water cooler for the purpose of cooling this water. This plant is situated in the basement adjacent to the dehumidifier, air being drawn from half-way up the building and returned to the roof through two large brick ducts.

The volume of air dealt with by the plant is 5,750,000 cu.



Left: Dehumidifier spray pump driven by a 35 b.h.p. motor. Right: One of two 120 b.h.p. Bull "super-silent" motors driving the "Freon" refrigerator for water cooling

ft. per hour and the complete equipment has involved the provision of a total of 350 h.p. Bull "super-silent" motors have been used throughout. There are two squirrel-cage machines of 2 h.p. and 3 h.p. at 925 r.p.m., while slip-ring motors comprise two of 120 h.p. each and two of 27 h.p. at 960 r.p.m., and one each of 15, 25 and 35 h.p. at 1,430 r.p.m. The 120-b.h.p. machines are two of the largest really extra-silent motors built and the care exercised in installation has been such that with all nine motors in operation noise from this source is imperceptible outside the plant-room.

Our acknowledgments are due to Mr. R. A. P. Morgan, chief engineer at Grosvenor House, for giving us an opportunity of inspecting the plant and to Messrs. York, Shipley, Ltd., the main contractors for the air-conditioning equipment.

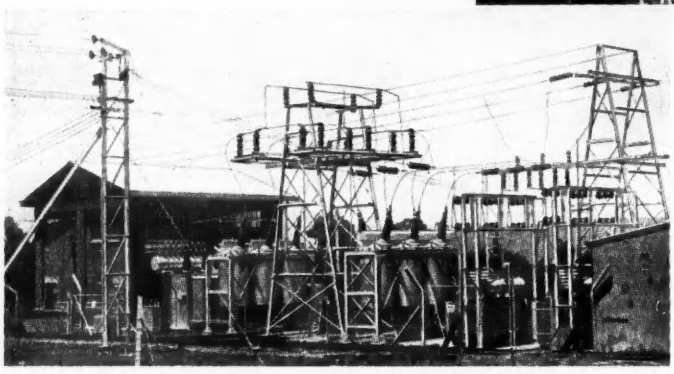
# Remarkable Expansion in South Africa

## Operations of the Electricity Supply Commission during 1936

A GROWTH in sales of 51 per cent.; reduction of the average price per kWh sold by more than 18 per cent.; and the initiation of power station extensions involving the installation of 242,600 kW of generating plant are the salient features of the 1936 report of the Electricity Supply Commission of South Africa.

Particularly gratifying is the fact that the unprecedented growth of consumption was contributed to by practically all classes of consumers. A large part is attributable to the gold mining industry, the demand for power for this purpose being such that the Commission decided to increase the installed capacity of its Klip power station—designed in 1934 for an ultimate installed capacity of 350,000 kW—to 424,000 kW, which will make it larger than any existing power station in the Southern Hemisphere. This, with other extensions projected, will bring up the installed capacity of generating plant in all the Commission's stations to 775,443 kW. The estimated cost of such works embarked upon in the course of last year is approximately £3,500,000.

**Aerial view of Escom House, the new headquarters of the Electricity Supply Commission in Johannesburg**



**Combined sub-station for local supply and mercury-arc rectifier for traction at Harrismith**

In the domestic field the achievements of the Commission are such that consumption has doubled in the past two years, the present average annual utilisation per consumer being 1,168 kWh. As regards rural supplies, numerous small towns and villages, mostly in the neighbourhood of power lines in the Western Cape Province and in Natal, were provided with supplies, largely as a result of the expansion of undertakings established primarily for traction purposes. Hire-purchase of domestic electrical appliances and assisted wiring, coupled with cooking demonstrations and talks have been particularly helpful in the rural areas.

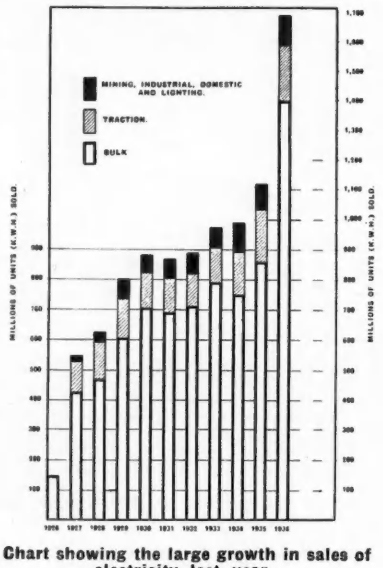



**Chart showing the large growth in sales of electricity last year**

Farm supply schemes have been developed mainly in the fruit-growing and wine-making areas of the South-Western Cape, where there are numerous groups of small farming communities making use of electricity not only for lighting and domestic purposes, but also for grape pressing, dairy work and water pumping. Steady progress is being made in other farming areas in the vicinity of the Commission's power lines, particularly in the districts of Merrivale and Dargle, Natal. At the end of the year there were 254 farms connected.

The year also witnessed considerable extension of electrified railway routes (ELECTRICAL REVIEW, June 18th and 25th, 1937).

Altogether, the Commission sold, in bulk supplies and direct, 1,688.1 million kWh as compared with 1,119.2 million kWh in 1935. Electricity generated amounted to 1,993.4 million kWh (Witbank, 741.3; Klip, 598.2; Salt River, 273.6; Colenso, 192.1; Congella, 180.8; and Sabie, 7.4). Coal consumed per kWh generated was 1.13 lb. at Salt River, 1.32 lb. at Congella, 1.44 lb. at Colenso, 1.62 lb. at Klip, and 1.79 lb. at Witbank, the average cost per ton (2,000 lb.) being respectively 25s. 4d., 15s. 5d., 11s., 3s. 2d., and 2s. 2d. The Sabie plant is hydro-electric.

In August last year the Commission's head office staff was transferred to the new headquarters at Escom House (although this was not then completed) which to-day is an outstanding landmark in Johannesburg. A feature of the building is the "Hall of Achievement," which is being used for a permanent exhibition of approved domestic electrical appliances from different countries.

On the financial side, the total assets of the Commission at December 31st were £17,227,878 and its liabilities £14,842,890, the excess of assets over liabilities (£2,384,988) having increased by £460,381 during the year. Expenditure on capital account rose during the period by £2,061,295 to £13,551,779.

Revenue amounted to £1,548,420 against £1,250,542, an increase of 24 per cent., while production costs increased from £1,218,802 to £1,539,368 (26 per cent.). The relatively small net surplus (£9,052) indicates the success of the Commission in framing its tariffs to accord with the principle of making neither a profit nor a loss.

The area of supply is now over 20,000 square miles, the Commission owning more than 1,200 route miles of overhead power lines and 65 route miles of underground cables. Excluding the Klip and Witbank stations, which are operated for the Commission by the Victoria Falls Co., the staff at December 31st numbered 462 Europeans and 400 non-Europeans.

# The Future of the Electric Vehicle

By Mac Armstrong and J. C. Owen*

AFTER years of hard technical work, ably supported by sales organisations, battery-driven vehicles have been definitely established as the most satisfactory means of local transport. The industry must now decide either to make a big change to ensure a successful future, or allow the trade to develop in a haphazard manner.

The time has arrived when a special effort should be made to put electric vehicles in a supreme position among commercial vehicles of all types. With this object in view we put forward some points to chief engineers of electricity supply undertakings, to directors of vehicle manufacturing companies, and to battery manufacturers for their serious consideration. A working agreement must first be inaugurated to ensure the closer co-operation of the three groups mentioned above.

We claim that such problems as speed, hill-climbing, controls, motors, &c., have been overcome. The question of a standard charge for electricity has received attention and off-peak charging will, we hope, be considered in the near future. The one serious obstacle to be surmounted is that of range, if we are seriously to compete with other means of transport.

## Previous Proposals

Every electric vehicle manufacturer in England, when first entering this field, had in mind one or more of the following systems:—

(1) Regenerative charging equipment, which may have been the most commonly discussed method, but after serious consideration it was discovered that the cost of such equipment was out of all proportion to the benefits.

(2) Standardised wheel diameters for given sizes of vehicles, worked out on the characteristics of each vehicle relative to body types and weight, again would not wholly overcome the question of range.

(3) Single unit battery slides, whereby a replenished crate could be added in place of a discharged unit, the increased voltage being sufficient to allow the vehicle to return to its depot. This did not overcome the range question; it only catered for doing away with towing the vehicle home at the end of a day's work, and, of course, the technical difficulty here was the running in series of fully charged and part-discharged cells.

(4) Public battery charging stations (pillars) have received considerable attention from vehicle manufacturers and supply engineers, and have been exploited in other countries with a fair amount of success. But it has been decided that the obstacles in this country are sufficient to make it an unpopular method of handling vehicles to secure extra mileage.

(5) Low-voltage, or dual-voltage, motors to operate with, or on, a half-voltage battery, have been considered, but have not been exploited in connection with light electric commercial vehicles. However, modern trolley-buses use batteries for manœuvring, operating a high-voltage motor on a low-voltage battery. This system, again, is a "get back to depôt" system, and does not solve the problem of range. Also the cost of the equipment is out of proportion to the benefits gained.

(6) On interchangeable battery racks there are many and varied views. The modern low-slung battery compartments, in most cases, do not permit the change to be made with ease. Further, most manufacturers utilise the space inside chassis frames for battery crates, the height of which is such that it will not permit of the crates being withdrawn.

The former systems, while in most cases having been set aside as impracticable for the reasons stated above, emphasise the fact that everyone connected with the electric vehicle industry realises that the question of increased range has got to be overcome.

## The "Fuelling" Problem

Until it had been proved beyond doubt that electric vehicles were a success and had come to stay, the capital needed for a great enterprise was not available. Electric vehicles are now known to be successful and they have come to stay. Pending some better means of energy storage being invented, the whole industry must agree that some system of battery changing must be introduced.

Petrol vehicle manufacturers are content to produce their vehicles, leaving the question of power in the able hands of petrol companies. Why should not electric vehicle manufacturers work on the same lines? Why should they not produce their vehicles and leave the question of power in the able hands of electricity undertakings? Years ago users of petrol vehicles purchased their petrol in two-gallon tins, there being a charge for the tin, which was credited upon being returned empty or changed for a full tin upon the next occasion. We suggest that a similar system could be devised for the power supply for electric vehicles. A user should be able to purchase electricity at a standard price, a charge being made for the battery, which would be credited upon being returned empty or exchanged when a further purchase of electricity was made.

We realise that in making this suggestion we have perhaps put the "cat among the pigeons." We realise, above all, that it means capital. It means that vehicle manufacturers would have to redesign all their models to allow for the easy and quick changing of a standard battery, and that battery manufacturers must produce batteries of standard sizes and capacities. It also means that electricity undertakings would have to arrange for battery-changing stations in different parts of their areas.

This system means putting the future success of electric vehicles in the hands of electricity undertakings, but with the E.D.A. organisation behind the undertakings the electric vehicle industry as a whole would have an excellent future.

Vehicle manufacturers may argue that the enormous cost of redesigning their models would be too great to make such drastic changes at, to them, this late date. Those manufacturers who also manufacture battery-charging equipment may point out that our proposals, if adopted, would mean a great reduction of work in their charging plant departments.

To these arguments we would answer that the cost of making the change-over would be more than covered by the increased profits from the larger number of vehicles sold. As regards the charging apparatus, this would give way to the much larger equipments needed by electricity undertakings at their numerous stations.

Battery manufacturers may use the same argument, but we would point out that standardisation is always a successful step to take in any business. In this system more batteries would be sold owing to the increased demand for vehicles, and, in addition to the batteries sold with vehicles, a further 25 per cent. (estimated) would be needed for replacing discharged batteries.

Electricity undertakings may object to the cost of establishing battery charging depots and the installation of charging equipment, with subsequent administration, but the revenue would more than compensate for the undertakings' outlay. Moreover, in many districts a.c. equipment is being installed and the d.c. equipment scrapped. Would it not be possible to make use of such d.c. plant under our system?

During 1936, 819 electric vehicles were registered for the first time in England, Scotland and Wales, bringing the approximate number of vehicles being used in December last to 2,600. If we estimate that each vehicle requires an average of 5,000 kWh per annum, we find that these vehicles were using 13,000,000 kWh per annum.

## Possible Results

The question arises, what increase in sales could the industry expect if our system were adopted? The increase of sales during 1936 against 1935 was approximately 30 per cent. We feel confident in stating that 1937 sales of vehicles will show a further increase of 50 per cent. This estimate is based on figures in our possession and, although the industry is up against the question of range, we quite expect that approximately 1,250 new vehicles will be licensed by December 31st next, which will mean an annual consumption of approximately 19,150,000 kWh per annum. If the question of range were overcome the increase would be nearer 300 per cent. in twelve months.

We consider that all vehicles should be approved by a competent committee before being put into service. Co-operation and standardisation would ensure that every user was able to cover the desired mileage instead of being limited by the battery capacity.

If our system were approved the initial cost of electric vehicles would be reduced considerably, as the purchaser would not have to purchase a large capacity battery to do his required mileage. He would purchase a vehicle for a given payload fitted with a standard battery to give a range of, say, 20 miles, even if some days he might need to do 60 miles. Again, with a smaller space required for batteries advantage could be taken to build bodies of a more useful type for the various trades.

Before writing this article we gave considerable thought to all the systems proposed in the past, and we make no apologies for submitting this battery changing system as explained above to all who are interested in the further development of electric vehicles. In any case we feel that our proposals should receive attention, and a meeting of responsible members of the electric vehicle industry should be convened at an early date to discuss them from all angles.

* Mr. Armstrong is connected with Wilson Electric Vehicles and Mr. Owen with the D.P. Battery Co.

# Correspondence

*Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication*

## Gas Rings on Electric Cookers

The letter from Mr. H. S. Trinder in your issue of August 6th seems quite reasonable and the tip quite good until it is examined, when, like many other tips, it will be found to be of little value and only prove to be a disappointment.

Mr. Trinder says in his first paragraph: "We in the electrical retail trade know that the heavy flat-bottomed utensil is essential," and then goes on to confess that he has never bought one and to lament that he has great difficulty in persuading people to buy them. He states, however, that he has overcome the difficulty by using the old-fashioned cheap flat-bottomed iron saucepans, which he finds give better results than the aluminium ones. This generalisation is, of course, misleading because we presume he means the ordinary aluminium saucepans he has in the house and not the special flat-bottomed aluminium utensils, in which case the term "better results" will still mean inefficiency even to commence with, and no one can tell in a year's time how much more inefficient the cooker will become due to the distortion of the utensils.

Apparently he does not know the real problem, *viz.*, that *all* pans, thick and thin, whether made in cast iron, brass, steel, copper, tin, enamelled iron, cast, pressed or spun aluminium, will distort unless properly constructed. Distortion or bulging of the bottom of a kettle or stewpan is caused solely by the simple yet invariable law which governs the expansion and contraction of metals; it is not luck or chance, nor does it matter whether the utensils are expensive or cheap. Unless the utensils are made in definite relation to this law they will, sooner or later, inevitably become bulged or hollow on the bottom. The thickness of the sides must be in relation to the thickness of the base. One must compensate the other to avoid distortion. There is no escape from this and, therefore, the supposed good tip may in actual fact turn out to be a most expensive one both to the householder and the electricity supply authority—the latter because the householder has lost her enthusiasm for her electric cooker and therefore cannot recommend her friends to have one installed.

Surely this is unsound selling and is merely trying to get over a difficulty by a temporary expedient without troubling about the future consequences. The repercussions of such a policy are far too serious, and affect not only the electric cooker in use but, what is even worse, the possible installation of further cookers, by reason of the complaints arising from slow cooking. The electric cooker has neither failed nor deteriorated; it is the utensil which was never right to begin with and gets steadily worse.

Again, it is fair to ask what other industry dare take such a risk. In the interests of a valuable industry nothing should be done which is merely temporary, but correctly constructed utensils should be supplied as part of the equipment. This is essential if the electric cooker is to be maintained as one of the most efficient cooking media on the market.

HAGUE & MCKENZIE, LTD.
T. N. Veitch, *Director*.

Birmingham, *August 10th*.

## Refusal to Supply

Your leader in last week's issue has the merit of bringing again to general notice a matter which cries for attention, but many engineers will agree with me in regarding as very undesirable the solution suggested by you.

The difficulty arises from the endeavour to deal, in one set of regulations, with the wiring of public buildings, industrial plants and houses—large and small. As the aim was the perfect installation, the result was a set of rules suitable for public buildings, where cost is a minor consideration. The industrial representatives on the I.E.E. Wiring Rules Committee recognised this distinction from the beginning, by insisting that the Rules should not be compulsory.

In respect of the domestic installations which form so large a part of wiring installation work the present position is very unsatisfactory, because the I.E.E. Rules are unsuitable for enforcement even if the undertakers had the power, and there are no alternative rules. This letter is therefore a plea for a set of simple regulations for domestic installations which could reasonably be enforced. This should represent minimum requirements only, and cable ratings should be based on the actual conditions of use.

For example, in living rooms and bedrooms (but not kitchens) the only high current apparatus to be anticipated are radiators—and the I.E.E. Rules compel the assumption that these will be fully in use when the ambient temperature is 100 deg. F. Even if the householder could withstand full radiator load during a heat wave of 80 deg. F., this would afford twice the temperature rise in the cable allowed by the I.E.E. Rules. (When account is taken of this matter of ambient temperature the cable installed in the case referred to in your leader will be found to be more than ample for the 4-kW load assumed by the undertaker.)

But there are many details of the I.E.E. Rules, other than cable ratings, which would unnecessarily increase the cost of a domestic installation, and I suggest the following considerations in favour of minimum wiring rules for domestic installations:—

(a) The continued prosperity of the manufacturers of domestic electrical appliances, as well as the full expansion of the domestic load, depends upon the maximum number of power-outlets in dwelling houses.

(b) It is therefore a matter of interest to the whole industry that power points should be as inexpensive as possible, consistent with safety, and the opposite result would be achieved by the enforcement of the present I.E.E. Rules.

(c) Wiring contractors should be in a position to compete with each other on a common basis—which involves the enforcement of some code of rules.

WILLIAM PEARSON, M.I.E.E.

Loughborough, *August 10th*.

## Labour and Distribution

As a result of the "White Paper" there has been considerable discussion regarding the effect of reorganisation of the electrical supply industry on the pockets of the consumers. I was very interested to read the reference in your issue of August 6th to the attitude of certain trade unions regarding compensation for men who may be displaced by any amalgamations.

There is another aspect of this important matter which so far appears to have been overlooked. At the present time the technical staffs of certain company undertakings are employed under conditions and at salaries which compare most unfavourably with similar posts in municipal undertakings. What safeguards, if any, will be applied to ensure that fair treatment and proper salary scales are introduced when these company undertakings are enlarged by the addition of adjacent supply areas?

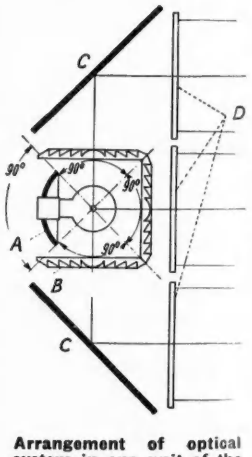
At the moment I have in mind one of the largest company undertakings in the country which has no recognised scale of salaries for its technical staff, who are consequently in many cases considerably underpaid. This concern, together with its subsidiaries, made profits last year approaching £1,000,000, but so far I understand that the technical staff have not participated.

Can it be doubted that from every point of view, including the consumers, nationalisation of the whole supply industry provides the most satisfactory solution to present problems?

*August 10th*. CHARTERED ELECTRICAL ENGINEER.

## New Landing Light for Airports

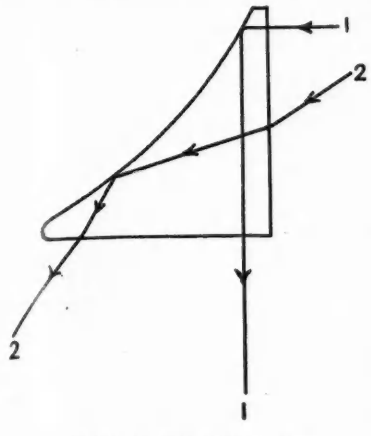
THE accompanying diagram, from *Die Lichttechnik*, shows the features of one of the units of the new Pintsch projector for ground lighting in airports. The optical system comprises a spherical mirror *A*, three Fresnel annular lenses *B*, plane mirrors *C*, and prismatic diffusing or scatter discs *D*. The luminous source is a 3-kW, 55-V lamp with a horizontal cylindrical filament occupying 85 mm. length and 5 mm. diameter (about 3.3 in. by 0.2 in.). The three Fresnel lenses collect light within a total angle of 270 deg., the remaining 90 deg. being collected by the spherical mirror, with the exception of the space occupied by the lampholder. The complete apparatus contains, vertically above one another, three pairs of lamp, lens and reflector units set side by side, providing a beam of 80-deg. divergence in the horizontal plane and a minimum illumination intensity of 3 lux (maximum 10 lux) within a curved triangular area, the base of which is about 760 metres (831 yards) from the projector. The 3-lux curve includes a rectangular area about 328 by 656 yd. on the centre line of the beam, and about 219 by 875 yd. on lines at 45 deg. thereto. The projector can be placed on a fixed or disappearing mounting or on a lorry; and to reduce the size of cable, supply is at about 1,000 V to a step-down transformer in the projector housing.




**Arrangement of optical system in one unit of the Pintsch projector**

# Improving Lamp Efficiency

IT is claimed for the "Amplilux" system of lighting that it enables more working light to be obtained from a lamp without increasing the wattage and, in general, without altering existing arrangements, or making use of new and costly reflectors. The principal component of this new system is a prismatic ring which is made to encircle any electric lamp. This ring depends for its actions on an old principle, namely, that of "total internal reflection." When a ray of light is travelling inside a block of glass towards a face bounded by air, then should the ray strike this face at an angle of incidence greater than a particular value, depending on the refractive index of the glass, and known as the "angle of total internal reflection," the face will act as a perfect reflector.



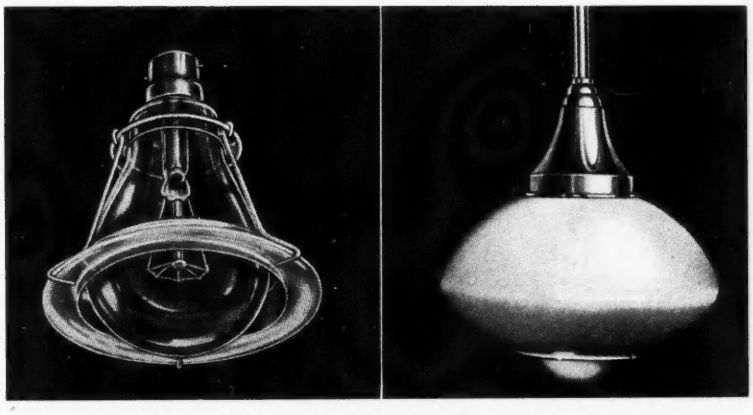

**Effect of "Amplilux" ring**

With an "Amplilux" prismatic ring fixed on a lamp rays of light leave the filament and strike the vertical inner face of the ring, and enter the glass (see accompanying sketch). They travel through the glass towards the inclined face so as to strike it always at an angle greater than the angle of total internal reflection and are therefore reflected downward. Moreover, the reflecting face of the ring is "taken off" at a special curve so that not only are the rays reflected downward, but they are also spread outward up to an angle of 45 deg. to the vertical. The prismatic ring therefore collects a narrow band of horizontal rays and re-directs them downward and outward to give increased illumination over a wide area of the working plane, and, since the faces of the ring are specially prepared, the reflection factor is much bigger than usual. By this means, it is claimed, a 100-W bare lamp with the ring will give appreciably more useful light than is obtainable from a 150-W lamp without the ring.

The ring can also be used on lamps fitted inside reflectors and shades. In these cases, although the ring intercepts a narrow band of light-rays which would ordinarily fall on the reflector, the reflection factor of the ring is so much bigger than that of the material from which the reflector is made that substantial increases in illumination are obtained. For instance, in vitreous enamelled reflectors the increase by adding the ring is 60 per cent., in opal conical shades the increase is 100 per cent., and in silvered shop-window reflectors it is from 40 per cent. upwards. Since the ring relies on total internal reflection, dust collection on the reflecting face makes no difference to the action, and there is no loss of efficiency due to tarnishing. The glass from which the ring is made will stand up well to heat shock and acid attack.

Apart from the use of the ring as an adjunct to bare lamps and existing fittings, a series of units is produced by the manufacturers (the Amplilux Lighting & Illumination Co., Ltd., 12, Grosvenor Gardens, London, S.W.1) which incorporate the ring as an integral part. These complete units are suitable for office and interior use and, since the fitting is suspended much nearer to the ceiling than to the working plane, the actual brightness of the ceiling is approximately equal to that of the working plane. The effect is restful and without any harshness or too great contrast. The lamp projects through the bottom of the unit, the exposed portion of the lamp being enamelled to give the impression that the globe of the unit and the bottom of the lamp form one continuous whole.

The following results are stated to have been achieved in the application of the ring. In theatres, adding the ring to footlights of the pattern in widest use, with standard batten lamps (*i.e.*, 60, 100 and 150 W, all having the same dimensions) resulted in doubling the amount of light on the scenery. In printer's composing rooms, they have reduced wattage by approximately 25 per cent. with a slight total increase of working light. In offices "Amplilux" 200-W units gave over twenty ft.-candles instead of eight ft.-candles with the same wattage in older units. On wharves an increase of 90 per cent. in light on the ground has been obtained by adding the rings to 300-W lamps on standards 70 ft. high.



**Left: Method of fitting ring. Right: A pendant embodying the device**

# Acoustical Conference

IN July of this year the first international conference on acoustics was summoned in Paris under the auspices of the International Electrotechnical Commission (I.E.C.). Under the presidency of Monsieur Duval, president of the French Electrotechnical Committee, about sixty delegates assembled from thirteen countries, including the United States (chairman, Dr. Harvey Fletcher), Germany (chairman, Dr. Grutzmacher), and Great Britain (chairman, Dr. G. W. C. Kaye and secretary, Mr. W. West). The proceedings were dealt with by five main committees, respectively concerned with vocabulary, fundamental units and methods of measurement (including noise meters), electro-acoustics, and noise abatement.

While substantial progress and agreement were reached by all the committees, chief interest centred in fundamental units and methods of measurement and the proposals eventually adopted agree in their entirety with the British standards as given in the British glossary (B.S.S. No. 661). Thanks to the conciliatory attitude of the delegates of Germany and the United States the "phon" and the "decibel" now become international units.

The Units and Measurement Committee adopted a report of a sub-committee on objective noise meters, which, under the chairmanship of Dr. A. H. Davis, drew attention to the fact that certain meters on the market employing quadratic rectification and other characteristics, while capable of dealing with certain sounds, were quite inadequate to interpret in phons many types of impulsive sound, but that other meters employing "leaky peak rectification" were substantially reliable for a wide range of steady and impulsive sounds. It was agreed, however, that at the present juncture a specification could not be formulated for a "universal" noise meter which would be capable of measuring on the phon scale any and every type of sound.

The Electro-acoustic Committee considered the standardisation of methods of testing microphones and loudspeakers, while the Architectural Acoustics Committee (which was officered by Great Britain) discussed the different procedure adopted in various countries for measuring acoustic absorption coefficients by the reverberation method. The investigation of the transmission of air-borne and impact sounds in buildings was also dealt with. The Noise-Abatement Committee contrasted the steps taken in different countries for reducing noise, and is to collate the experience gained.

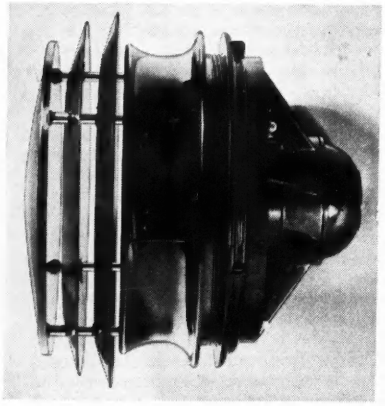
At the final plenary meeting it was agreed that in future the work should be carried forward under the auspices of the Federation of National Standardising Bodies known as the International Standards Association, the I.E.C. concurring and actively collaborating.

# New Apparatus and Devices

## *for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes*

### Window Fitting Fan

An addition has been made by VENT-AXIA, LTD., 9, Victoria Street, London, S.W.1, to its window and wall fittings extraction fans in the form of a new 9-in. model in moulded glossy black bakelite.



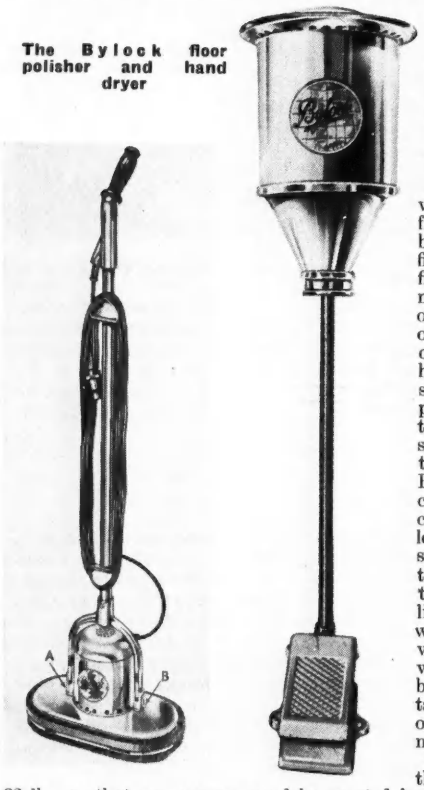
**The "Vent-Axia" window-fitting fan**

It has specially designed louvres which afford protection from the weather and also help to induce air extraction when the winds blows on them. Like the 6-in. size it is a complete unit in itself and is supplied ready for screwing on to any window pane, partition or wall. The totally enclosed motor has two speeds enabling air to be extracted at either 17,000 or 22,000 cu. ft. per min. A two-way rotary switch and two yards of three-core c.t.s. cable are supplied with each unit.

### A Floor Polisher and a Hand Dryer

Recent developments by BYLOCK ELECTRIC, LTD., 109, South Street, Ponders End, apart from the company's range of vacuum cleaners, include a floor polisher and a hand dryer.

The floor polisher is a moderately priced machine employing two horizontal revolving brushes driven at 500-600 r.p.m. by a ¼ h.p. motor. Round the outside of the frame is a thick rubber buffer to prevent damage to furniture, and below this a fixed brush is fitted. For normal use only one sixth of the quantity of wax used for hand polishing should be applied, and it is then unnecessary to change the brushes. Removal for cleaning is accomplished by loosening two screws, turning the brush to the right and lifting off. A washer is provided so that wear in the brush can be taken up without replacement.




**The Bylock floor polisher and hand dryer**

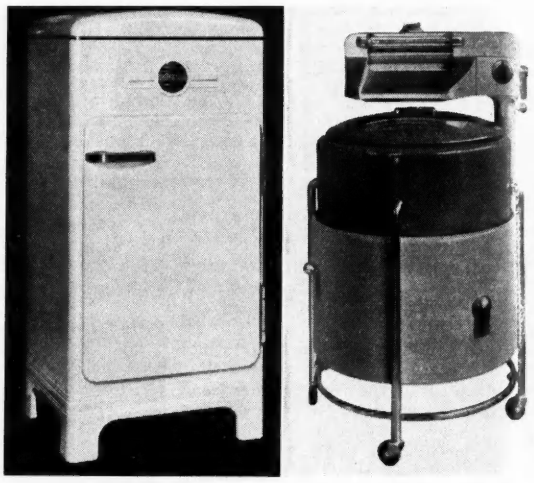
The weight of the machine is 22 lb., so that no pressure need be exerted by the user, and control is simplified by the provision of a switch in the handle. Several yards of flex is supplied and is held neatly in place on the handle when the cleaner is out of use. The adaptor is suitable for lampholders or two-pin sockets, and chromium plate is the standard finish, while oilers ("A" and "B") are provided at the handle pivots.

Designed originally for use in hospitals for contagious diseases where several thousand paper towels are used each month, the new hand dryer has many other applications, such as in factories and restaurants. It is chromium plated or white enamelled, and is controlled by a foot-operated mercury switch, a ½-h.p. motor being used to force warm filtered and disinfected air through the orifice at the bottom of the canister. Air enters through holes in the underside of the rim, thereby eliminating the risk of the motor being fouled by matches or cigarette ends dropped in the top. The total loading of the motor and heater (wired in series) is 1½ kW.

### Washing Machines and Refrigerators

Improved "Kenmore" washing machines and "Coldspot" refrigerators are the latest development introduced by SEARSINT, LTD., 203, Regent Street, London, W.1.

The "Kenmore Four Star" embodies several novel features, for instance the "minute meter," which automatically stops the wringer at any given time from one to fifteen minutes, and the "Touch-a-Bar" safety roller release which stops the wringer and at the same time releases the pressure on the rollers.



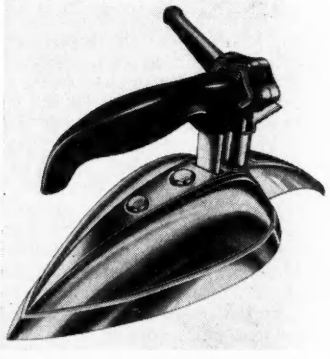
**The "Coldspot Super 4" refrigerator and "Kenmore Four Star" washer**

The driving mechanism is totally enclosed and fitted with an automatic clutch, and the agitator is multi-vaned. The cadmium-plated wringer is reversible and fitted with an easy resetting device. The capacity of the tub is 25 gal., sufficient to wash 60 lb. of dry clothes per hour. Triple-coated porcelain enamel is the finish for the interior and a motor-driven pump empties the tub without tilting. The tub itself is mounted on rubber in a polished aluminium cradle of attractive appearance.

There is also a new refrigerator known as the "Coldspot Super 4," with a gross interior capacity of 4.65 cu. ft. and a shelf area of 9¼ sq. ft. The two aluminium ice cube trays make 64 ice cubes (5 lb.) at a time. Exterior finish is "Dulux" and the interior is in porcelain enamel.

### Domestic Electric Irons

Three new models have been added to the range of electric irons manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. These comprise a moderately priced iron in nickel plate, a chromium "streamlined" iron and a universal voltage iron of heavier weight and higher loading than the travelling model. Each iron is supplied with earthed connector and 9 ft. of three-core flexible.



**The G.E.C. "streamlined" iron**

The streamlined bevelled toe facilitates negotiation of pleats and buttons. The design of the handle enables either the left or right hand to be used with the same degree of comfort, while the side-entry bakelite connector has a rubber sleeve to support and insulate completely the flexible cord. This iron weighs 5 lb. and is loaded at 500 W.

The cheaper iron is not fitted with a separate thumb rest, but the extra length of a specially shaped wooden handle provides adequate support. These new models are not intended to replace the present range of "Magnet" irons.

# Electricity Consumption in Industry

PRELIMINARY statistics relating to the fifth Census of Production of 1935 are appearing fortnightly in the *Board of Trade Journal*. Below we give the details of the consumption of electricity during 1935 in rather more than half of the trades covered; the remainder will be published as soon as statistics are available. The figures do not take into account firms employing not more than ten persons on an average during the year.

| | Generated in same works. Thous.kWh | Generated in other works under same ownership. Thous.kWh | Purchased. Thous.kWh | Total. Thous.kWh |
|---|---|---|---|---|
| **IRON AND STEEL TRADES.** | | | | |
| Blast furnaces | 190,119 | 71,340 | 57,472 | 318,940 |
| Smelting and rolling | 376,747 | 175,840 | 421,281 | 973,868 |
| Foundries | 20,951 | 27,685 | 115,884 | 164,520 |
| Tinplate | 13,291 | 12,998 | 26,434 | 52,723 |
| Wrought iron and steel | 2,788 | 3,493 | 95,902 | 102,183 |
| Small arms (private firms) | — | — | 1,193 | 1,193 |
| Hardware, hollow-ware, metallic furniture and sheet metal | 12,500 | 1,880 | 92,489 | 106,869 |
| Chain, nail, screw and miscellaneous forgings | 2,934 | 717 | 84,816 | 88,467 |
| Wire | 12,338 | 6,527 | 75,816 | 94,681 |
| Tools and implements | 626 | 181 | 34,138 | 34,945 |
| Cutlery | 811 | — | 8,610 | 9,421 |
| Needles, pins and metal small wares | 2,834 | — | 5,923 | 8,757 |
| **ENGINEERING, SHIPBUILDING AND VEHICLE TRADES.** | | | | |
| Mechanical engineering | 127,217 | 8,169 | 468,507 | 603,893 |
| Electrical engineering | 50,279 | 31 | 357,618 | 407,928 |
| Shipbuilding | 3,928 | 3,606 | 84,398 | 91,932 |
| Motor and cycle manufacturing firms | 74,013 | 457 | 286,620 | 361,090 |
| Motor and cycle repairing firms | 1,682 | 2,521 | 20,953 | 25,156 |
| Aircraft | 1,227 | 1,157 | 36,191 | 38,575 |
| Railway carriage and wagon building | 4,211 | 222 | 44,306 | 48,739 |
| Carriages, carts and wagons | 7 | — | 2,245 | 2,252 |
| **NON-FERROUS METAL TRADES.** | | | | |
| Copper and brass trade (smelting, rolling, etc.) | 38,188 | — | 91,583 | 129,771 |
| Aluminium, lead, tin, etc., trades (smelting, rolling, etc.) | 111,741 | — | 294,864 | 406,605 |
| Gold and silver refining | — | — | 5,532* | 5,532 |
| Finished brass | 2,200 | — | 26,324 | 28,524 |
| Plate and jewellery | 92 | 18 | 14,006 | 14,116 |
| Watches and clocks | 5 | — | 1,403 | 1,408 |
| **TEXTILE TRADES.** | | | | |
| Cotton spinning and doubling | 76,586 | 2,101 | 257,228 | 335,915 |
| Cotton weaving | 19,494 | 2,031 | 78,451 | 99,976 |
| Jute trade | 13,425 | 729 | 34,036 | 46,190 |
| Linen and hemp: | | | | |
| Great Britain | 2,630 | 18 | 6,680 | 9,328 |
| Northern Ireland | 20,857 | 114 | 6,405 | 27,376 |
| Silk and artificial silk | 202,449 | 6,933 | 237,886 | 447,268 |
| Hosiery | 4,031 | 691 | 45,928 | 50,650 |
| Rope, twine and net | 671 | — | 20,460 | 21,131 |
| Canvas goods and sacks | 197 | 185 | 2,818 | 3,200 |
| Asbestos goods and engine and boiler packing | 1,269 | 185 | 18,046 | 19,500 |
| Elastic webbing | 343 | 6 | 3,366 | 3,715 |

* So far as recorded separately

| | Generated in same works. Thous.kWh | Generated in other works under same ownership. Thous.kWh | Purchased. Thous.kWh | Total. Thous.kWh |
|---|---|---|---|---|
| **TEXTILE TRADES.**—(*Cont.*) | | | | |
| Coir fibre, horse-hair and feather | 817 | — | 3,607 | 4,424 |
| Roofing felts | 26 | 319 | 1,189 | 1,534 |
| Woollen and worsted | 143,261 | 6,034 | 123,468 | 272,763 |
| Textile finishing | 87,980 | 2,806 | 84,855 | 175,641 |
| Lace warehouses | 224 | — | 168 | 392 |
| Lace manufacturers | 1,688 | — | 5,713 | 7,401 |
| Flock and rag | 512 | — | 6,700 | 7,212 |
| Packing | — | — | 1,811 | 1,811 |
| **FOOD TRADES.** | | | | |
| Grain milling | 18,398 | 1,401 | 208,898 | 228,697 |
| Biscuit | 706 | — | 25,635 | 26,341 |
| Preserved foods | 4,946 | 429 | 21,601 | 26,976 |
| Butter, cheese, condensed milk and margarine | 18,478 | 3,733 | 14,946 | 37,157 |
| Cattle, dog and poultry foods | 426 | 12 | 26,540 | 26,978 |
| Bread, cakes, etc. | 522 | 141 | 57,366 | 58,029 |
| Cocoa and sugar confectionery | 12,669 | — | 83,803 | 96,472 |
| Bacon curing and sausages | 3,275 | — | 15,288 | 18,563 |
| Sugar and glucose | 145,101 | — | 6,314 | 151,415 |
| Fish curing | 1 | 7 | 1,256 | 1,264 |
| Ice | 1,145 | 139 | 47,722 | 47,006 |
| **DRINK AND TOBACCO TRADES.** | | | | |
| Brewing and malting | 5,083 | — | 60,741 | 65,824 |
| Spirit distilling | 7,775 | 2 | 9,701 | 17,478 |
| Spirit rectifying, compounding and methylating | — | 4 | 360 | 364 |
| Aerated waters, cider, vinegar and British wine | 308 | — | 6,453 | 6,761 |
| Wholesale bottling | 842 | 576 | 35,654 | 37,072 |
| Tobacco | 2,715 | — | 16,127 | 18,842 |
| **CHEMICAL AND ALLIED TRADES.** | | | | |
| Chemicals, dyestuffs and drugs | 552,793 | 209,058 | 231,886 | 993,737 |
| Fertiliser, disinfectant, glue and allied trades | 8,299 | 2,394 | 20,632 | 31,325 |
| Explosives and fireworks | 2,506 | — | 13,191 | 15,697 |
| Matches | 2,668 | — | 46 | 2,714 |
| Ink, gum and typewriter requisites | 411 | 106 | 5,898 | 6,415 |
| Soap, candles and perfumery | 26,925 | 300 | 14,140 | 41,365 |
| Paint, colour and varnish | 1,931 | 403 | 39,461 | 41,795 |
| Seed crushing | 28,395 | 7,116 | 46,549 | 82,060 |
| Oil and tallow | 2,507 | 16,123 | 19,736 | 38,366 |
| Petroleum | 34,043 | — | 14,075 | 48,118 |
| Starch and polishes | 1,736 | 960 | 8,077 | 10,773 |
| **CLAY AND BUILDING MATERIAL TRADES.** | | | | |
| Brick and fireclay | 20,743 | 22,946 | 139,081 | 182,770 |
| China and earthenware | 4,145 | 776 | 29,400 | 34,321 |
| Glass | 55,328 | — | 107,325 | 162,653 |
| Cement | 156,814 | 19,312 | 402,764 | 578,890 |
| Building materials | 1,895 | 4,890 | 24,384 | 31,169 |

# Adverse Factors at Southend

SOME factors adversely affecting the Southend electricity undertaking are frankly discussed by Mr. A. C. Johnson, the borough electrical engineer and manager, in his report for 1936-37. During the last few years, he says, the tendency has been for costs to increase more rapidly than income, and as a result the surplus of £36,000 in 1933-34 will be reduced to practically nothing in the present year. There has been a large expenditure on mains, machinery and in connection with the change-over, the full benefit of which will not be felt until the plant is reasonably well loaded. The next few years will, therefore, form a critical period, and the only alternative to a small deficit will be to raise the tariffs on an average by ½d. per kWh. This might be disastrous, as it would not only raise prices to an uneconomic level but would have a bad psychological effect. Mr. Johnson concludes that the only solution is to use every endeavour to increase sales, and on this point he finds that the Corporation is not as helpful as it might be.

The fact that, notwithstanding the comparatively low prices (¾d. and ½d. under the domestic tariff) electricity is not making as rapid strides at Southend as in some other parts of the country is, in the engineer's opinion, due partly to the lack of support given to the undertaking by other Committees. When new Corporation premises are erected opportunities are not generally afforded for thorough investigation of the relative advantages of electricity and other forms of fuel. Many Corporations, he points out, are developing their estates on an all-electric basis, and generally adopting electricity for all purposes. This example goes a long way towards influencing the policy of private builders, and the resulting increased consumption has an appreciable effect in reducing the cost per kWh for bulk supplies. Because the network at Southend is more developed than in many other areas it is all the more important to concentrate on securing maximum possible sales.

Notwithstanding the limited assistance given by electrical contractors in consequence of the Council's decision to pay a commission of one quarter's rental on cookers, water heaters and wash boilers there has been a decided setback in the hire of domestic apparatus; this the engineer attributes to the keen competition of the gas company, which is more virile and creative than ever and has a large number of agents in the borough. He therefore recommends that the offer of a commission shall be extended to builders, builders' merchants and house agents as from the current month, and advises that the Electricity Committee shall again consider the question of selling apparatus direct to consumers at list prices so that the Department may compete on more equal terms with its competitors.

A plea for better train services is put forward. Lack of adequate facilities of this nature is believed to be the reason for the number of vacant premises at Southend being higher than in any other residential area in the vicinity of London.

Additional amenities would also help. The publicity given to the town by the illuminations has attracted a number of visitors, some of whom are now residents, but the effect is likely to fall off as other resorts emulate Southend's example, especially if the Council decides to curtail further expenditure. Experience has shown that new features are essential.

Adding interest which would have accrued, contributions in aid of the general rates to date represent over £100,000, or one-eighth of the annual outstanding debt and annual loan charges. If the money so allocated had been devoted to reductions in tariffs, as would probably have been the case, £16,000 would have been saved in income-tax, the output would have

increased and this in turn would have further reduced the price per kWh. Whatever advantages have been derived from the Corporation have been liberally repaid, and for the past seven years the borough electrical engineer has consistently opposed the transference of money to the Rate Fund, especially when this has meant abandoning the sound policy of paying for meters out of revenue. In spite of the prospect of no surplus for 1937-38, however, the borough treasurer considers the undertaking sufficiently sound to make a further contribution this year to the relief of the local rates.

Another point is that the Southend undertaking is the most highly assessed of thirty-two undertakings of comparable size for which statistics have been compiled over a period of three years, the amount paid last year in rates being £27,000 (equivalent to more than a 4½d. rate). It is considered regrettable that the Government's proposals for the reorganisation of distribution make no recommendations regarding the standardisation of assessments.

# New Books

**Lessons and Problems in Electricity.** By Newell C. Page. Pp. xiv+356; figs. 161. London: Macmillan & Co. Price 12s.

The scope of this book is perhaps more clearly expressed in the preface than in the title, *i.e.*, . . . "to meet the needs of students planning to enter the engineering sciences." However, . . . "physical, rather than engineering principles have been emphasised." The "problems" part of the book is represented by upwards of 400 well-chosen examples, certain of which have answers attached.

The few expressions which may, on account of the American authorship, have a strange sound to a student accustomed to British engineering terminology, are no bar to the recommendation which this book certainly deserves as a sound basis for a first year's electrical engineering course. Among such expressions are "condensance" for capacitive reactance and "side thrusts" for the mechanical forces on conductors in magnetic fields. Only a few references are made and these to publications generally accessible. The diagrams, which do not include unhelpful photographs and sketches, are good. The text is lucidly arranged and the clarity is enhanced by the format.

The book is wide in range without being diffuse. Owing to its insistence on the principles rather than on the technical applications of electricity, electrical machinery is but lightly touched on. Certain sections, such as references to conduction in gases and in high vacua, and the differential equations for the propagation of electromagnetic radiation, are chiefly useful for stimulating the interest of the student. The idea of a varying current, leading easily to that of an alternating current, is introduced very clearly when considering the heating effects of currents, early in the book.

The least satisfactory part of the text appears to be that dealing with the alternating current circuit. The device of the vector diagram is mentioned too late, and the space devoted to the complex notation for a.c. working is insufficient for a clear understanding of this essential matter. The whole section on a.c. circuits is too compressed, and a student would probably find this a real handicap, particularly as certain formulæ are not evolved in sufficient detail. Polyphase circuits are touched on, the elementary calculations being given for power and rotating fields with three-phase working.

A useful short chapter on dimensions and systems of units, including a description of the principle of an absolute method of measuring resistance is included at the end. The book is valuable for its wide outlook and can be recommended to students who wish to obtain a knowledge of the fundamentals of electrical engineering practice based on modern physical concepts.

**Wireless: Its Principles and Practice.** By R. W. Hutchinson. (Fourth edition.) Pp. 332; figs. 232. London: University Tutorial Press. Price 3s. 6d. net.

This is the fourth, and enlarged, edition of a book first published four years ago with the object of providing a clear insight into the fundamentals of wireless theory and its practical working. In the main it consists of a non-mathematical textbook on broadcast reception, though a little space is devoted to transmission and the propagation of waves. No previous knowledge of electricity is assumed, and the first quarter of the book is devoted to the theory of electricity, with special reference to wireless circuits.

In this edition parts have been simplified or extended and new matter has been introduced on short-wave working and directional signalling. In this last section it is noted that reference is made to short-wave beacon stations round our coasts, but, in fact, no such stations are in operation, though experiments with the sort of station referred to were carried out some years ago.

The fundamental principles of wireless signalling, with special reference to receiving circuits, are outlined in a simple manner, especially suitable for students in technical classes and for amateur experimenters.

**Génératrices et Moteurs à Courant Continu.** By Edouard Roth and Joseph Bardin. Pp. 223; figs. 85. Paris: Librairie Armand Colin. Price 13 fr.

This book is one of the well-known "Collection Armand Colin," and the authors are associated with the Société Als-Thom (one as chief engineer). Within the strictly limited space at their disposal, the authors present a treatment of d.c. generators and motors which is within the compass of students, while meeting all their normal requirements, and at the same time will be very acceptable to many engineers in practice.

The introductory chapter on the basic principles and constructional elements of d.c. machines is sufficiently elementary for the beginner and yet contains nothing that is not strictly necessary to the later development of the subject. The production of the magnetic flux is next dealt with, such matters as stray field and tooth saturation being taken into account. The chapter on armature windings is excellent, the diagrams being very clear, if a trifle small. Thence, the authors proceed to the study of generator operating characteristics, on open circuit and on load, dealing clearly and concisely with all the factors which influence performance. Shunt, series and compound generators are considered; also, the problems of parallel operation.

The operation of motors forms the subject of another chapter, and useful notes on such matters as Ward-Leonard sets and parallel and series combinations of motors are included. Commutation and commutating poles occupy the remaining chapters, more than a quarter of the whole book, the treatment extending from the elementary theory to the characteristics of interpoles. A useful bibliography of relevant French literature is appended. No attempt is made to include worked examples of complete designs, but the reader is given an admirable treatment of the properties of d.c. machines, and all the information required to determine their leading dimensions and operating characteristics.

**Short Wave Radio.** By J. H. Reyner. Pp. 162; figs. 83. London: Sir Isaac Pitman & Sons. Price 8s. 6d. net.

In most radio textbooks a chapter or two is devoted to short-wave communication, but this has developed extensively and so rapidly within the last few years that it is convenient to have the subject dealt with in a volume of its own. The book forms, in large measure, a companion volume to the author's "Modern Radio Communication."

The reader is assumed to understand something of radio technique generally, but to require a non-mathematical summary of the present position regarding the theory and practice of short-wave working. The whole subject is considered, including ultra-short waves and micro-waves, in a concise and clear manner, and, as the scope of the book does not allow of extensive explanations, references are quoted to enable the reader to delve deeper if he so desires. The information given is accurate and up to date, several references being made to developments which have occurred within the last few months.

This book forms a reliable and readable summary of the latest developments in short-wave radio communication.

## Shorter Notices

"Electrical Installation Rules and Tables for Rapid Reference," by W. S. Ibbetson (E. & F. N. Spon, Ltd., London, price 2s. 6d.), has been written for the use of practical wiremen, contractors, engineers and architects, and is produced in convenient pocket form. The book opens with a brief digest of sections of the I.E.E. Regulations and here the actual section headings and paragraph numbers of the official regulations are adhered to. Tables are included relating to a.c. and d.c. motors, cables, lighting costs, heating, power and wages, while illumination design receives special attention.

The sixth impression of "Electrical Definitions and Formulæ for Students," compiled by Philip Kemp (Sir Isaac Pitman & Sons, Ltd., London, 6d.), is now available. In this small volume of thirty-seven pages special care has been taken in grouping the formulæ under the main headings of the subject and in providing definitions in the simplest form possible.

In the seventh edition of "Electric Wiring Tables," by W. Perren Maycock (revised by F. C. Raphael), (Sir Isaac Pitman & Sons, Ltd., London, 3s. 6d.), considerable additions and alterations have been made in the tables of conductors, &c. Additional tables have also been incorporated for l.c. cables, and modifications have been made in the conduit tables.

"Measurement of Radiant Energy," edited by W. E. Forsythe. Pp. 452; figs. 224. London: McGraw Hill Publishing Co. Price 30s.

"A Course in Electrical Engineering—Vol. I, Direct Currents," by C. L. Dawes. (Third edition.) Pp. 751; figs. London: McGraw-Hill Publishing Co. Price 24s.

"Business Charts," by T. G. Rose. (Third edition.) Pp. 100; figs. 34. Price 7s. 6d. net. London: Sir Isaac Pitman & Sons, Ltd.

"Technical Electricity," by J. E. Phillips and R. W. B. Stephens. Pp. 288; figs. 187. London: Technical Press, Ltd. Price 7s. 6d.

# Business and Industrial Notes

**The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.**

## Ismay Group Changes

Owing to a change of interest, Halcyon Radio, whose products have hitherto been handled by Ismay Distributors, will in future handle its own distribution of radio and television sets. According to the *Financial Times*, Mr. J. Ismay and Mr. H. C. Rawson have resigned from the board of Halcyon Radio. Mr. W. Hill, Mr. I. Jeffcott and Mr. H. E. Penrose are the new directors. For the present, Halcyon Radio will continue to have its products manufactured by Sterling Works (Dagenham), which is now only manufacturing for the trade under Marconi licence. Halcyon Radio has secured contracts for the manufacture of several well-known sets previously imported. It will continue to manufacture for the British Blue Spot Company, which will in future, nevertheless, handle its own distribution. Ismay Distributors will not, in future, be interested in the radio trade, but will still continue to sell domestic electrical appliances. Halcyon Radio was in the Ismay Industries group, to which Ismay Distributors, Sterling Works (Dagenham), and the British Blue Spot Company belong.

## An Apprenticeship Scheme

The United Steel Companies, Ltd., Sheffield, has introduced an apprenticeship scheme for the benefit of youths between 16½ and 18½ years of age who are sons of employés and have had public school or secondary school training and hold a matriculation certificate. The first year of training will commence in September. In all, the scheme will consist of three years at the home works of each youth, and a fourth year spent in visiting the other principal works of the company. The boys will receive 17s. per week for the first year, 20s. for the second, 23s. for the third, and 28s. for the fourth year, plus a scholarship which may be granted to each of two boys every year from each of the works of the company.

## Synthetic Rubber Production in Italy

The Rome correspondent of *The Times* reports that a Royal Decree has been published authorising the Italian Government to introduce measures to favour the production of synthetic rubber in Italy and her colonies, an objective included in the national programme of economic self-sufficiency. These measures include the modification of duties on certain imported products, the exemption from Customs duty of imported machinery and raw materials necessary for the production of synthetic rubber, and the granting of other fiscal facilities, subsidies, and financial contributions. The Finance Minister is also authorised to grant assistance up to 3,000,000 lire (about £32,000) annually for the next five years to approved bodies and companies which undertake appropriate research work.

## Pyrotenax Cables

The *Financial Times* reports that Imperial Chemical Industries and A. Reyrolle & Co. have acquired a predominating interest in Pyrotenax. This company was formed in April, 1936, and took its present name in March last. It manufactures fireproof cables under patent rights acquired from France. It is understood that Imperial Chemical Industries is to supply certain of the materials used in the manufacture of the company's products.

## Orders Recently Booked

Darlington Town Council last week accepted the tender of the General Electric Co., Ltd., for a 20,000-kW turbo-alternator, despite the fact that it was £8,000 above that of a Belgian firm. Councillor Blumer, moving that the Belgian tender be accepted, said that British electrical manufacturers were working at full pressure, and he preferred to save £8,000. The Belgian firm, he understood, was partly British. Alderman Lend pointed out that if the G.E.C. tender was accepted the work would be done in this country with British materials, and a good job was guaranteed. Only three members of the Council voted in favour of the Belgian tender.

W. Canning & Co., Ltd., of Birmingham, have received through their Chinese agents at Shanghai an order for a copper refining plant for the Chinese Government. We learn from the company that the plant has been ordered through the Ministry of National Resources in connection with a reform in the Chinese currency. The tender for the equipment has been under negotiation for three years, and has been subject to international competition.

## Radio Receivers in Germany

It is officially stated that the price of the national receiver in Germany has been reduced to 59 Reichmarks, and that an improved national set will shortly be available.

## Catalogues Required

Mr. A. McNeill, 66, Basket Road, Whitehaven, Cumberland, asks for catalogues, price lists and informative literature of electrical supplies, particularly for mines.

## Siamese Electrical Imports

Although the United Kingdom slightly increased its exports of electrical goods and apparatus (including machinery) to Siam during 1935-36, the United States still remains the principal source of supply. This is shown in a report on economic and commercial conditions in Siam prepared for the Department of Overseas Trade (Stationery Office, 1s. net), by Mr. J. Bailey, British Consul-General at Bangkok. Imports increased to ticals 2,026,848 (11 ticals=£1), as compared with tcs. 1,688,293 in 1934-35. United Kingdom imports were valued at tcs. 183,257, and those from the United States at tcs. 589,307. The Siamese Government continues the policy of installing electric generating plants for the provincial municipalities and during 1936 two new stations were opened and additions made to three others. In all cases plants of United Kingdom manufacture were installed, though prices were higher than Continental offers. In 1935 three new generating stations were opened. Recently orders have, however, been placed in Germany, price being the main consideration. Electric cables and wire originated mainly from the Continent and Japan, the British article being considered too expensive.

## United States Electrical Exports

The exports of electrical machinery and allied material from the United States during the five months ended with May last attained a value of £9,240,000, as compared with £7,220,000 in the corresponding period of 1936.

## Proposed Exhibition at Exeter

At a recent meeting of the Exeter Corporation Electricity Committee the electrical engineer reported that the District Electrical Association proposed to hold an electrical exhibition at the Civic Hall during the week commencing October 4th next. There would be from twenty to twenty-five stands, and the secretary to the Association had inquired whether the electricity undertaking would assist by providing the necessary

**The new showrooms of the British General Electric Co., Ltd., at Christchurch, N.Z.**

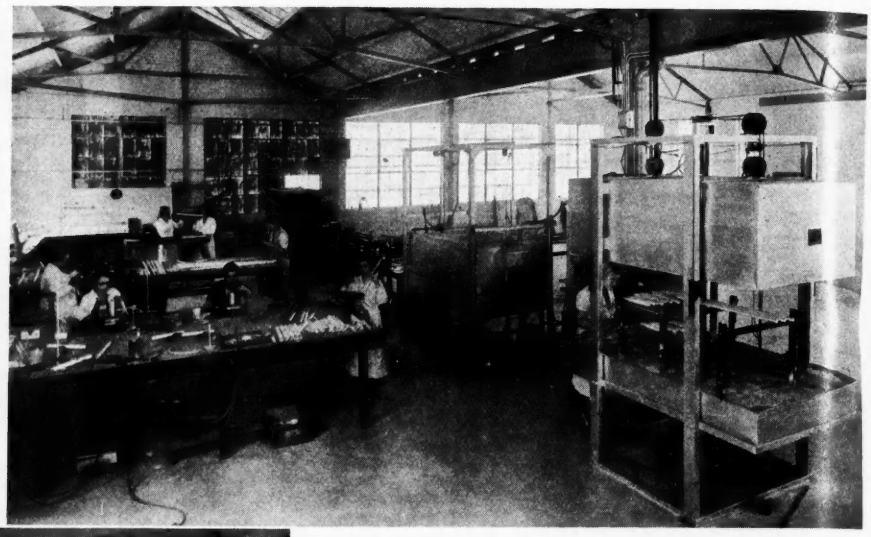
electricity supply to these stands free of charge and make a donation towards the cost of the exhibition. The Association was prepared to provide free space and a free stand to enable an exhibition of domestic apparatus to be given by the electricity undertaking. The cost of a free supply of electricity for the exhibition would amount to approximately £21. The request was acceded to.

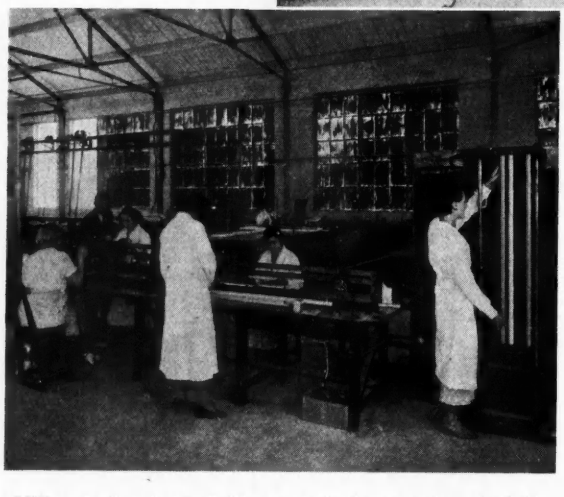
## Russian Electrical Machinery Imports

According to a return just to hand, the imports of electrical machinery and allied material into Soviet Russia during the first quarter of the current year attained a value, reckoning roubles at 10 to the £, of £871,300, as compared with £1,011,499 in the corresponding three months of 1936.

## Making Tubular Lamps

The manufacture of architectural tubular lamps presents problems quite distinct from those appertaining to ordinary vacuum or gasfilled lamps, and a definitely specialised technique is necessary. By employing hand production almost entirely in its new works at Abbeydale Road, Wembley, the Union Lamp & Lighting Co., Ltd., claims to make a lamp with a constant light right to the ends and with no black spots. Equipped with up-to-date and modernised appliances, the single-storey factory is designed for straight-line production and is practically self-contained, all the glass-cutting, bending and seaming, stem fitting, filament making, exhausting, capping, testing, &c., being carried out in the one shop. Improvement in the design of the exhausting ovens, each of which takes forty-eight 4-ft. lamps, has reduced the time required for this process to half an hour. In addition to the standard 30-mm. and 40-mm. tubes of all the usual colours, both in plain and ribbed glass, the company manufactures tube lamps as small as 15 mm. which can be bent to form letters and are also useful for such purposes as picture lighting. Candle-type lamps and units with silvered interior reflectors can also be supplied. All the lamps are fitted with special long-life filaments which are suspended over flexible spines, the advantages of which may be judged by the fact that the London, Midland and Scottish Railway is now using large traction, candle and architectural lamps for its "Coronation" trains. The lamps have also been approved by the Air Ministry for use in civil aircraft and for this purpose a 12-V architectural tube is being made. As the company did not take over the factory till a few weeks ago only about half of the 5,000 sq. ft. of floor space has so far been laid out. By the end of the year it is hoped to have automatic machines installed for making low-priced candle lamps, the remaining space being utilised for stores and a costing section. Adjoining the factory are well-planned offices for the administrative staff and a separate room which is being equipped as a laboratory. The directors of the company, which was formed in December last, are Mr. V. S. W. Smyth (managing director), Mr. R. F. S. Leslie (chairman) and Mr. L. G. Brown.





*[Elec. Rev. photos.*

**A general view of the Union Lamp and Lighting Co.'s new works and (left) the spine-making and capping section**

## A Fireproof "Flex" Competition

It is reported that the Municipal Council of Paris has accepted a proposal to organise a competition for an improved form of electrical conductor for house and building wiring purposes more proof against fire than the ordinary flex at present in use.

## Pulverised Mica

A new form of mica has been introduced into this country by Messrs. A. Mason, Globe Works, Boundary St., Hyde Rd., Manchester, 12, which appears to possess some interesting properties likely to be of service to the electrical industry. Known as "Mason Flakes," the material is in the form of micro-laminar flakes of silicates of aluminium. The density is very low, a cubic decimetre weighing only 250 to 275 grammes. Of stable chemical composition, the substance is unaffected by acids and vapours and has no effect on metals. Indeed, it is said to be an excellent rust-preventing product. It is practically incombustible and has a melting point as high as 1,400 deg. C. Very low heat conductance renders the material suitable for use as a heat insulator in connection with both heating and refrigerating equipment and in the form of filling braids, cushions and coverings. The flakes adapt themselves to flexion, pressure, torsion and vibration without becoming disintegrated or transformed into a non-insulating "mass." Incorporation of the material in the insulation of rubber-covered cables makes for increased resistance to heat, protection against the effects of current frequency and protection against oxidation of the rubber surface. The preferred method of use consists in rubbing the cables with the powder between each of the insulating layers around the conductor and, for the outer covering, mixing the flakes with the rubber before vulcanisation.

The singular property of surface tension, which brings the flakes to the surface of moulded objects into whose composition they have entered, renders the powder particularly suitable for incorporation in storage battery boxes. The result is a very effective "armouring" of the inner and outer surfaces with a shell of fish-scale texture embedded in the material. This shell, it is claimed, increases the dielectric resistance to such a degree that the moulding will stand two or three times the voltage without breakdown. The micro-laminar structure renders the flakes self-lubricating, a property which greatly facilitates moulding operations with better distribution of the material. While up to 60 per cent. powdered mica can be employed in the moulding mixture satisfactorily, 30 to 35 per cent. is recommended for general purposes.

## The Railway Year Book

In its 600 pages the 1937-38 edition of the "Universal Directory of Railway Officials and Railway Year Book" contains information invaluable to all persons doing business with railways. It is arranged geographically, but for ready reference there are three indexes to countries, officials, and general items.

## Electrically Operated Sluices

New tidal sluices at Allington Locks, on the River Medway, near Maidstone, were formally put into operation last week by the Minister of Agriculture. Constructed at a cost of £18,000, they consist of three vertically rising roller gates. The larger two are electrically operated by hand switchgear and the smaller is electrically and automatically controlled in order to maintain a level in the navigation pen above the sluices in normal times of flow.

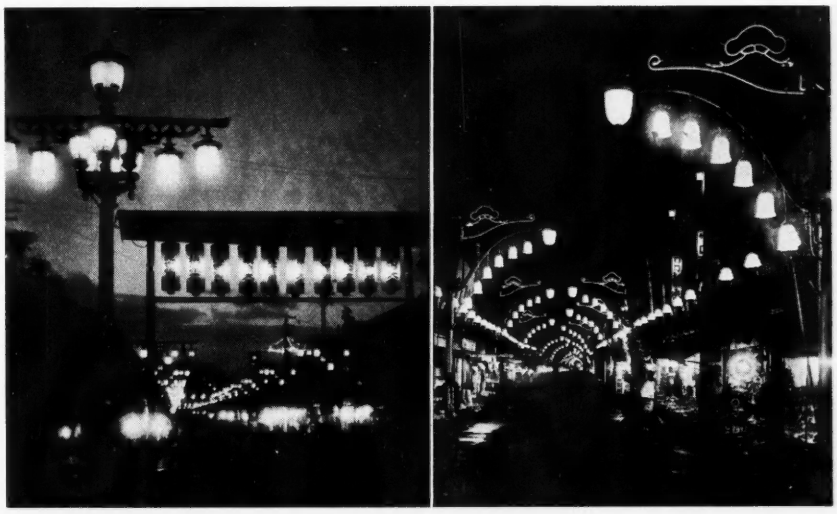
## A New Armoured Cable

The Société Industrielle des Téléphones of Paris has recently taken out a patent in respect of a new method of armouring insulated electric cables with the object of providing greater

protection against any crushing action. The chief feature of the new cable lies in the use round the insulated cable of a spiral of high-resistance steel wire and embedding this in an outer layer of rubber or other supple material capable of withstanding abrasion.

## In Modern Japan

We are indebted to the Société pour le Développement des Applications de l'Electricité for the accompanying illustrations which appeared in the August issue of *B.I.P.*, the society's monthly journal. Our contemporary says that it is complained that the traditional charm of Old Japan is being swept away by the encroachment of European civilisation, but actually Japan is assimilating Western ideas to its heritage of ancient beauty. As an example of this, electric lighting is noteworthy. As the pictures



**Street lighting in modern Japan**

show, the use of the most modern means of lighting is not incompatible with the oriental scene. The left-hand illustration is a view of the Asakusa-Nakamise Avenue, Tokyo, on the sides of which are multi-light standards equipped with pendant and inverted bell-shaped fittings. Across the roadway is an arch surmounted by a row of cylindrical lighting fittings inscribed with Japanese characters. The other picture shows the Bansyozi street, Nagoya, in which similar lighting bells are employed.

## Prices of Materials

**The following prices are only general, and they may vary according to quantities and other circumstances :—**

| CHEMICALS ETC. | Price. August 11th. | Fortnight's Inc. or Dec. |
|---|---|---|
| *a* Acid Oxalic ... ... ... ... per cwt. | 50s. | — |
| *a* Ammoniac, Sal ... ... ... per ton | £36 | — |
| *a* Ammonia, Muriate (large crystal) ... „ | £18 10s. | — |
| *a* Borax ... ... ... ... ... | £17 | — |
| *a* Copper, Sulphate ... ... ... „ | £22 10s. | £7 inc. |
| *a* Potash, Chlorate ... ... ... per lb. | 3¾d. to 4¼d. | — |
| „ Perchlorate ... ... ... „ | 6d. | — |
| *a* Shellac ... ... ... ... per cwt. | £4 18s. | — |
| *a* Sulphur, Commercial ... ... per ton | £11 | — |
| *a* „ Roll ... ... ... ... „ | £11 | — |
| *a* Soda Chlorate ... ... ... per lb. | 3½d. to 3¾d. | — |
| *a* „ Crystals ... ... ... ... per ton | £5 to £5 5s. | — |
| *a* Sodium Bichromate, casks ... ... per lb. | 4d. nett. | — |
| METALS, ETC. | | |
| *b* Aluminium, Ingots ... ... ... per ton | £100 to £105 | — |
| *b* „ Wire ... ... ... per lb. | 1/1 to 1/9 | — |
| *b* „ Sheet and Foil ... ... „ | 1/3 to 2/9 | — |
| Babbitts Metal and Anti-friction Metals— | | |
| Grade I ... ... ... per ton net | £249 | £5 inc. |
| Grade II ... ... ... ... „ | £172 | £3 inc. |
| Grade III ... ... ... ... „ | £91 | £1 inc. |
| Brass (rolled metal 2″ to 12″ basis) ... per lb. | 10d. | ¼d. inc. |
| *c* „ Tubes (solid drawn) ... ... „ | 1/0¾ to 1/1 | ¼d. inc. |
| *c* „ Wire, basis ... ... ... „ | 10½d. | ¼d. inc. |
| *c* Copper Tubes (solid drawn) ... „ | 1/2¼d. | ¼d. inc. |
| *g* „ Bars (best selected) ... ... per ton | £97 | £4 inc. |
| *g* „ Sheet ... ... ... „ | | |
| *g* „ Rod ... ... ... ... „ | | |
| *d* „ (Electrolytic) Bars ... ... „ | £67 10s. | £3 inc. |
| *d* „ „ Wire Rods ... „ | £72 10s. | £4 inc. |
| *d* „ „ H.C. Wire ... per lb. | 10⅜d. | ¼d. inc. |
| *f* Ebonite Rod ¼″ dia. & up ... ... „ | 1/10 to 2/9 | — |
| *f* „ Sheet ⅛″ thick & up ... „ | 1/7 to 1/10 | — |
| *n* German Silver Wire, Nos. 1 to 12 ... „ | 2/5 | — |
| *h* Gutta-percha, fine ... ... ... „ | nom. | — |
| *h* India-rubber, Para-fine ... ... „ | 9¼d. | ¼d. dec. |
| *i* Iron, Pig (Cleveland, No. 3) ... per ton | £4 5s. 0d. | — |
| *i* „ Wire galv. No. 1, P.O. Qual. ... „ | £23 | — |
| *g* Lead, English Pig ... ... ... „ | £25 10s. | 5s. inc. |
| *g* Mercury ... ... ... ... per bot. | £13 10s. | £1 11s. dec. |
| *c* Mica (in original cases) small ... per lb. | 10d. to 2/- | — |
| *c* „ „ „ medium ... „ | 6/- to 12/6 | — |
| *c* „ „ „ large ... „ | 13/- to 17/6 up | — |
| *p* Phosphor Bronze, plain castings ... „ | 1/3½ | — |
| *p* „ „ drawn bars & rods „ | 1/4 | ¼d. inc. |
| *p* „ „ rolled strip & sheet „ | 1/2 | ¼d. inc. |
| *p* „ „ wire ... ... „ | 1/3½ | ¼d. inc. |
| *o* Platinum ... ... ... ... per oz. | £10 5s. | — |
| *d* Silicium Bronze Wire ... ... per lb. | 11¼d. | ¼d. inc. |
| *g* Spelter ... ... ... ... per ton | £25 10s. | £3 1s. 3d. inc. |
| *r* Steel, Magnet, in bars ... ... per lb. | 7¼d. | — |
| *g* Tin, Block (English) ... ... per ton | £268 | £3 inc. |
| *a* „ Wire, Nos. 1 to 16 ... ... per lb. | 4/3 | — |

Quotations supplied by :—

*a* G. Boor & Co.
*b* The British Aluminium Co., Ltd.
*c* Thos. Bolton & Sons, Ltd.
*d* Frederick Smith & Co.
F. Wiggins & Sons.
India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
*g* Henry Gardner & Co., Ltd.
*h* Edward Till & Co.
*i* Bolling & Lowe.
*n* P. Ormiston & Sons.
*o* Johnson Matthey & Co.
*p* C. Clifford & Sons, Ltd.
*r* W. F. Dennis & Co.

**The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.**

## Trade Announcements

J. H. Tucker & Co., Ltd., have opened new London offices, showrooms, trade counter and stores at 2, Newman Street, W.1, under the managership of Mr. L. Davey. The telephone number is Museum 6081.

Brown Brothers, Ltd., have completed the structural alterations at their Cornfield Road, Eastbourne, branch, and as a result they are able to carry considerably augmented stocks of electrical goods of all kinds.

The Simplex Electric Co., Ltd., has opened a new depôt at 39, St. James Street, Brighton, 1 (telephone: Brighton 4222, telegraphic address: Simplex, Brighton). The new depôt will be in charge of Mr. R. F. Arnold, under the general direction of the company's London management. Representative stocks of "Simplex" and "Creda" products will be maintained together with a full range of general wiring supplies and accessories, including "Mersey" cables.

Mr. A. F. Wright, who has for eight years been manager of the Cranbrook branch of the Storage Electrical Co., Ltd., whose headquarters are at Tunbridge Wells, has acquired the Cranbrook business and will continue it on his own account.

## World Radio Trade

According to information published by the German Reich Statistical Board the decline in the world's exports of radio apparatus which took place during the world trade depression has not yet been overtaken. In 1936, however, the largest share in the world exports was held by the United States. Next in order, it is stated, were Holland, Germany and Great Britain.

## New Braiding Machinery Works

J. B. Hyde & Co., Ltd., Wythenshawe, Manchester, have issued a booklet describing their new works, which have been equipped particularly for the production of braiding machinery. The descriptive matter is prefaced by a brief outline of the company's progress since its formation in 1908 by the late Mr. J. B. Hyde. The booklet includes a number of excellent illustrations of the works.

## Fire at G.E.C. Witton Works

A fire occurred last Sunday evening, in the maintenance section of the works of the General Electric Co., Ltd., at Witton. The outbreak was quickly overcome by the works fire brigade and a contingent of the Aston Fire Brigade. No damage was done and the output of the works has not been affected in any way.

## For Sale

Woolwich Electricity Department invites offers for the purchase of one 2,000-kW turbo-alternator and surface condensing plant.

(See our classified advertisements.)

## New Catalogues and Lists

**British Insulated Cables, Ltd.,** Prescot.—Leaflets describing mining boxes.

**Ferranti, Ltd.,** Hollinwood, Lancs.—An illustrated catalogue of the new season's fires.

**C.A.V.-Bosch, Ltd.,** Acton, London, W.3.—A pamphlet describing the company's range of switchboards and switch panels.

**S. Guiterman & Co., Ltd.,** 35 and 36, Aldermanbury, London, E.C.2.—A catalogue, illustrated in colour, of "Oaklite" lighting fittings.

## Bankruptcy Proceedings

**L. W. Meredith,** Lenton Lodge, Derby Avenue, Skegness, Lincolnshire, lately carrying on business at Prince George Street and High Street, Skegness, and who has since the date of the filing of the petition removed to 2, Vine Road, Skegness, electrical engineer.—The public examination herein was continued recently at the Municipal Buildings, Boston. It was reported that debtor had not lodged a statement of affairs in the bankruptcy proceedings. It was also stated that on September 18th, 1925, he filed his petition in bankruptcy, and on May 1st,

1931, another receiving order was made against him. On the latter occasion he had paid his creditors a dividend of 1s. 8¾d. in the £ on their claims of £1,343. He had not obtained his discharge from either of those two bankruptcies. In February this year he called a meeting of creditors, when a statement of affairs was submitted showing unsecured liabilities of £3,401 and assets estimated to realise £1,465. At a further meeting held on March 3rd this year another statement showed unsecured liabilities of £3,348, and assets of £505. Asked to account for the considerable difference in the assets on those statements debtor said that in the first case he thought the particulars were taken from the selling prices of the assets, instead of cost prices. The Deputy Official Receiver pointed out that the debts of the previous bankruptcies would have to be added to the present liabilities. He read over to debtor a list of the creditors, and debtor admitted that a number of them were not told that he was an undischarged bankrupt. The examination was adjourned, debtor being ordered to prepare a goods account from the commencement of his business.

**H. G. Hayward** (Modern Electric Service), electrical engineer and radio dealer, formerly of Cambridge Road, and 186, Bitterne Road, Bitterne Park, Southampton, now residing at 42, Wilton Avenue, Southampton.—Last day for receiving proofs for dividend August 18th. Trustee, Mr. A. L. Medcalf, 10, Rockstone Place, Southampton.

**S. D. Bennett,** 2, Burnt Ash Parade, Lee, London, wireless and electrical retailer.—The receiving order herein was made on the debtor's own petition recently. His statement of affairs shows ranking liabilities of £529 and net assets of £22, leaving a deficiency of £507. Debtor attributes his failure to the decline in trade.

**J. E. Denley** (J.E.D. Installations), electrical contractor, 67, Stracey Road, Forest Gate, E.7.—Supplemental dividend of 7¾d. in the £, payable any day (except Saturday), at Bankruptcy Buildings, Carey Street, W.C.2.

**C. W. Coombes,** electrical engineer, "Verdley," Portsmouth Road, Milford, Surrey.—Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C.1, Official Receiver, released July 28th.

**H. F. Salt,** electrical engineer and radio dealer, Holly Bank, Rudyard, Leek, Staffs.—Public examination September 30th at the Town Hall, Hanley, Stoke-on-Trent.

**L. C. Wright,** radio dealer, "Dalton," Beechley Road, Wrexham.—Public examination September 16th at the County Hall, Wrexham.

### Company Liquidations

**London Electric Appliances, Ltd.**—Winding up voluntarily. Liquidator, Mr. O. G. Sunderland, 15, Eastcheap, E.C.3.

**Wiring, Ltd.**—Winding up voluntarily. Liquidator, Mr. A. E. Attwood, Balfour House, Finsbury Pavement, E.C.2.

**Kyffin Hughes, Ltd.**—Meetings September 13th, at 15, Park Row, Nottingham, to receive an account of the winding-up by the liquidator, Mr. C. F. Carlisle.

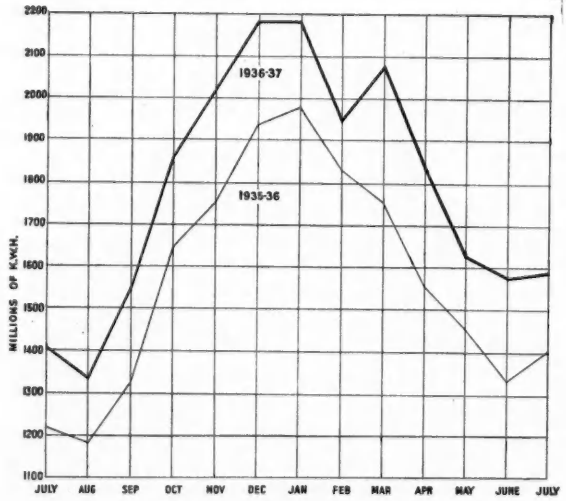
**Standard Rediffusion Services, Ltd.**—Winding up voluntarily. Liquidator, Mr. W. C. Thornton Cran, Bush House, Aldwych, W.C.

### Dissolution of Partnership

**Harold Hammond & Co.,** electrical and radio engineers, 103, Church Street, Bilston.—Messrs. H. Hammond and H. W. Williams have dissolved partnership. Mr. Hammond will attend to debts and carry on the business.

## Generation of Electricity in July

THE official returns rendered to the Electricity Commissioners show that 1,588 million kWh of electricity were generated by authorised undertakings in Great Britain during July, as compared with the revised figure of 1,403 million kWh for the corresponding month of 1936, representing an increase of 185 million kWh, or 13.2 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was 27, the same as last year. During the first seven months of 1937 up to the end of July the total amount of electricity generated by authorised undertakings was 12,810 million kWh, as compared with the revised figure of 11,295 million kWh for the corresponding period of 1936, representing an increase of 1,515 million kWh, or 13.4 per cent.




**Comparative output curves**

# Electricity Supply

## Lighting, Domestic, Power

**Australia.**—IMPORTANT POWER SCHEMES.—The Premier of Victoria has announced that it has been decided to proceed with the Kiewa Valley hydro-electric scheme, and to extend the metropolitan power station. The total cost of these developments is £8,750,000, to be spread over fourteen years.

**Barking.**—SUPPLY EXTENSION.—Sanction has been obtained to borrow £1,389 in respect of works in connection with the supply of electricity to the Invicta Foil Co.'s works in Alfred's Way.

**Basingstoke.**—E.H.V. RING MAIN.—Application is to be made by the Town Council for sanction to a loan of £5,460 for extending the e.h.v. overhead line to Sherfield-on-Loddon and Bramley, to complete the 11-kV ring main at Sherborne North.

**Bolton.**—SUB-STATIONS.—Sanction is being sought by the Electricity Committee to borrow £25,000 for sub-stations.

FRINGE ORDER.—The Electricity Committee is seeking an Order permitting it to supply premises within the area of supply of the Horwich Council.

**Bootle.**—ELECTRIC-DISCHARGE LIGHTING.—Sodium electric-discharge lighting is to be installed at Coffee House Bridge at a cost of £182.

**Bridgend.**—DISAGREEMENT OVER CHARGES.—The Council supplies electricity to Kenfig Hill, which is in the Penybont rural district, and at conferences between the two authorities the Bridgend Council has been endeavouring to arrange a tariff which will be more economic to the undertaking. The Penybont Council, it is understood, has offered to pay the grid tariff plus an apportionment for the cost of the line, which serves Porthcawl and Laleston as well as Kenfig Hill, and has expressed willingness to submit its case to the Electricity Commissioners, providing the Bridgend Council will be prepared to accept the Commissioners' decision as final and binding. It is stated that the Bridgend Council is not prepared to do this, but wishes to reserve to itself the right of appeal against the decision of the Commissioners.

**Bromley.**—DEPARTMENT'S PROGRESS.—During 1936-37 the policy of the Electricity Department (engineer, Mr. W. G. Trend) of strengthening the mains to assure an abundant supply of energy has been continued, the re-cabling of the third section of the town area being completed in accordance with the three-year programme approved in 1934. In December the Council decided to extend the hire scheme to include all types of domestic water-heating apparatus, and during the succeeding three months twenty-four immersion and twenty-seven storage heaters were fixed on consumers' premises. Since the end of the financial year the demand for this apparatus has considerably increased, and by the beginning of July there were 246 heaters of various types and sizes on consumers' premises. The increase in output during the year was again considerable (21 per cent.), the total sales being 16.2 million kWh. The load factor improved from 23.51 to 26.86 per cent.

**Canada.**—BRIDGE LIGHTING.—When the New Westminster bridge is opened to the public it will be unique from the standpoint of illumination, states *Electrical News and Engineering*. For this purpose sodium vapour lighting equipment developed and manufactured in Canada by the Canadian General Electric Co., Ltd., will be used. Although sodium lamps are being employed extensively for highway and bridge lighting in the United States, this will be the first installation of its kind in Canada. Automatic control will be incorporated.

**Chailey (Sussex).**—EXTENSIONS.—No objection is to be made by the Rural District Council to the proposal of the Seaford and Newhaven Electricity Co. to erect l.v. overhead lines at Rodmell and to that of the Ringmer and District Electricity Co. to lay l.v. underground cables at Hamsey and St. John's Without (Lewes).

**Cleethorpes.**—ALL-ROUND REDUCTIONS.—The Council has authorised general reductions of a substantial nature in electricity charges, to come into force on October 1st. For lighting the new rate is 4d. (in place of 5d.) per kWh, and for slot meters (no meter rent) 5d. (6d.) per kWh. The kW charges under the maximum demand lighting and domestic rate for shops, factories, theatres and hotels, &c., are to be modified, as also are the rateable value charges of the domestic scale, the "unit" rate in both cases remaining at ½d. The power flat rate is to be 2d. (2½d) per kWh for the first 450 kWh per quarter, and 1½d. (2d.) thereafter. The kW charge of the maximum demand power rate is also being revised.

**Colchester.**—CHEAPER LIGHTING.—The following reductions in charges have been authorised by the Town Council: Lighting flat rate both in the borough and extended area reduced to 4½d. per kWh for all consumption in excess of 50 kWh per quarter, the price up to 50 kWh to remain as at present, namely, 5½d. in the borough and 7d. in the extended area. The lighting rate for large users is reduced from £12 to £10 per annum per kW of installed load, with a 10 per cent. higher distribution charge in the extended area.

SUPPLY TO ESTATE.—A supply of electricity is to be afforded to houses and flats about to be erected on St. Mary's Lodge estate, at an estimated cost of £959.

**Darlington.**—HIGH-VOLTAGE CABLES.—Application is being made by the Town Council for sanction to borrow £6,763 for high-voltage cables.

**Denmark.**—NEW POWER STATION.—Under the direction of the North Zealand electricity supply undertaking and in association with the municipality of Frederiksberg a new power station is to be erected at Ise Fjord, Denmark, at a cost of about £1,000,000. The work is expected to take three years.

**Glasgow.**—ELECTRO-MEDICAL EQUIPMENT.—Approval has been given by the Health Committee to a proposal to establish a new department for X-ray diagnosis and therapy, and also to modernise the facilities for electro-therapy at the Southern General Hospital. The approximate cost is £6,000.

SUBSTANTIAL PROFIT.—The annual report of the Electricity Department shows that there was a substantial increase both in output and revenue during the year ended May 31st last. The gross revenue amounted to £1,378,500, and expenditure came to £1,233,125. Out of the balance of £145,370 the sum of £74,749 was applied to capital expenditure, leaving a net profit of £70,625 on the year's operations. The profit in the previous year was about £30,000. The full balance carried forward was £159,223. Electricity sold reached the record total of 413,000,000 kWh and the receipts from the sale of energy came to £1,357,600. The cost of production, notwithstanding the increase in coal prices, worked out at the lowest figure per kWh yet attained, namely, 0.7159d. The report states that the outlook is very bright; the present industrial activity promises a further expansion of business.

**Grampians.**—SUPPLY EXTENSIONS.—The Electricity Commissioners have under consideration a number of schemes submitted by the Grampian Electricity Co. for the extension of supply through different parts of Inverness-shire, Ross-shire, Sutherland, and, later, as far north as the borders of Caithness. One of the most interesting projects is the supply of electricity along Loch Ness-side as far as Fort Augustus. Northwards, one of the transmission schemes will extend as far as Brora and Dornoch.

**Gravesend.**—PREPAYMENT METERS.—The borough electrical engineer has been instructed to submit a report at the next meeting of the Electricity Committee showing the comparative costs, over a period of twelve months, of supply by prepayment meters and quarterly accounts.

**Haslingden.**—ELECTRICITY FOR QUARRIES.—The Electricity Committee has approved the provision of supplies of electricity to Troy Quarry, Grane, and Duckworth Clough Quarry, Haslingden, on special terms.

PROPOSED CONCESSIONS.—The borough electrical engineer and borough treasurer have been instructed to apply a portion of the electricity profits to reducing charges.

METER TESTING.—It is proposed to establish a meter-testing station at the Prinny Hill sub-station.

**Hull.**—ELECTRICAL SCHEME FAVOURED.—The City Hospital at Cottingham is to have an electrical system for heating, domestic hot-water supply, and the supply of steam to the laundry. The Health and Public Assistance Committee, in its recommendation to this effect, stated that the capital cost was estimated at £5,310 and the annual expenditure at £2,873, as compared with £7,156 and £1,327, respectively, for a coal-fired installation.

ELECTRICAL INSTALLATIONS.—Electricity is to be installed at cookery and laundry centres in Wheeler Street at a cost of £430.

LOANS.—Sanction has been obtained to loans of £25,000 for wiring installations and £8,111 for siding extensions at the Sculcoates power station.

SUPPLY TO VILLAGES.—The Corporation recently completed arrangements for supplying electricity to Tickton, Routh and Storkhill, and the switching on was performed by Lady Samman.

HIGH-VOLTAGE EXTENSIONS.—The high-voltage mains network is to be extended at a cost of £7,754.

**Ilford.**—FURTHER CONCESSION.—In June reductions in electricity charges were authorised. The Borough Council has now decided to extend to the winter months the rate of three kWh a penny at present in force for the summer months.

**India.**—DELHI ELECTRICITY SCHEME.—The Delhi Municipality has drafted a scheme for improving the electricity supply system which it hopes to finance by means of a loan from the Government. A capital expenditure of Rs.46 lakhs is entailed. Under the scheme the generation of electricity will be on a strictly non-profit basis. The existing power house outside Delhi Gate will be used and appropriate extensions will be made. If possible, Delhi will be linked with the Punjab hydro-electric system. The maximum rate per kWh will be 2¾ annas, a reduction of 20 per cent. on the present rate. It is anticipated that it will be possible to scale down charges by 25 per cent. within the next five years.

MYSORE.—The Mysore Government has sanctioned the Shimsha and Gersoppa hydro-electric schemes, the former being estimated to cost Rs.56 lakhs and the latter Rs.200 lakhs. The project for the generation of power from the falls of the Gersoppa River will take at least four years to complete, but the programme of construction is to be framed so as to permit it to be carried through in stages. The major items of expenditure will be a storage reservoir at Honnemarad, with a capacity of 7,200 million cu. ft. (Rs.36 lakhs); four 12,500-kW generating units (Rs.28 lakhs); four penstock lines with forebay equipments (Rs.24 lakhs); and double circuit transmission lines from Gersoppa to Bhadravat (Rs.14 lakhs). The Shimsha scheme has been somewhat altered from the original plan, and the reservoir for power purposes is now to be built above the Shimsha falls.

TRAVANCORE PALLIVASAL SCHEME.—Progress on this scheme was somewhat retarded in the past year owing to difficulties encountered during construction of foundations, &c. A fresh site for the power-house has been chosen, and foundation work is expected to be fully complete by the end of the year. It has been decided that the supply of power should be extended as far as Quilon. It is proposed to appoint a commercial engineer to undertake intensive propaganda at this stage, to canvass consumers for the use of electrical energy in the various parts of the State, and to give the public all the necessary data. It is now estimated that the total expenditure on the scheme will be Rs.136 lakhs, and it is hoped that all the works will be expedited and the scheme brought into operation by the end of next year.

**Ivybridge.**—EXTENSION.—The Plympton St. Mary Rural District Council is promoting a Special Order to extend its area of supply to include Ivybridge.

**Kent.**—ELECTRICAL INSTALLATION.—Electricity is to be installed at the Institution at Eastry, near Sandwich, at an estimated cost of £900.

**Kettering.**—ELECTRICAL PROGRESS.—Reductions in electricity charges decided upon eighteen months ago have resulted in a loss of revenue to the Electricity Department for 1936-37 amounting to £16,000, despite which and various increased costs the net profit was £3,929. During the year the number of consumers increased by 1,845, or 11 per cent., and the output by 20 per cent. to 23.5 million kWh.

STREET LIGHTING.—The Electricity Committee is to assume the responsibility for lighting and maintaining public lamps. The Housing, Town Planning and Streets Committee will still determine where public lighting is required or needs extension or improvement.

OUTER AREA CHARGES.—The Burton Latimer, Desborough, Market Harborough and Rothwell Urban District Councils are of the opinion that charges in the originally extended area should be identical with those operating in Kettering, and have asked to be furnished with information as to the annual loan charges in relation to works outside the Kettering urban district. The Kettering U.D.C. Electricity Charges Sub-Committee is to give consideration to the matter.

SUB-STATION.—A sub-station is to be erected by the Department in Sheep Street.

**King's Ferry.**—NEW PLANT.—The Southern Railway Co. states that the oil engine and dynamo supplying electricity for the operation of the King's Ferry Bridge, general lighting, and the operation of the traffic control signals require renewal. The estimated cost is £1,386. It is also the company's intention to modernise the lifting gear and motors, at a later date, in order to obviate a breakdown similar to that which occurred in 1936.

**Leeds.**—SUB-STATION.—The Electricity Committee is to erect a sub-station on the Belle Isle estate.

**Liverpool.**—STREET LIGHTING SURVEY.—Mr. P. J. Robinson, lighting engineer to the Corporation, reports that of the streets, courts, and passages which are lighted by the Corporation, 343 miles are electrically illuminated and 597 miles lighted by gas. Of the 16,200 electric lamps in use, 757 are of the sodium type, the majority of the remainder being between 60 and 150 W. The system of operating electrically lighted street lamps from one or more central points by means of superimposing a high-frequency impulse on the electric mains has been further extended during the year by the inclusion of 1,713 lamps. The total number of lamps now operated by this system from twenty-three control points is 4,342, of which 3,189 are operated by individual units and 1,153 operated by seventy-eight group units. The net expenditure of the Department for the year amounted to £129,619, representing a rate of approximately 5.61d. in the £, as compared with a net expenditure of £120,354 and a rate of 5.005d. in the previous year.

**Machynlleth.** — POWER STATION DESTROYED. — The power station of the Machynlleth Electric Supply Co., Ltd., was destroyed by fire last week. The plant installed at the station included one 110-h.p. and one 35-h.p. Francis water turbines, one 100-h.p. Diesel oil engine, and three Brush alternators.

**Morecambe.**—PROPOSED WORKS.—The Electricity Committee is to erect sub-stations at Middleton Road and Seymour Grove, at a cost of £4,244. A sum of £1,368 is also to be spent on extending the e.h.v. overhead line to Sunderland Point, while the Committee is seeking sanction to borrow £20,000 for mains extensions.

**Oswestry.**—EXTENSIONS.—The Town Council has authorised electricity extensions to outlying districts, at an estimated cost of nearly £3,000.

**Peterhead.**—NEW STREET LIGHTING.—The streets of Peterhead are now wholly lighted by electricity. The new system was switched on for the first time in place of the former gas lighting on August 1st. Before the end of the last lighting season fifty-four standards had been erected in the principal streets of the town; that number has now been increased to 169. Two types of lamp are being used, namely, 250-W mercury electric-discharge lamps for the larger standards and 80-W lamps of the same type for the smaller standards. At

the close of a tour of inspection members of the Town Council were entertained to tea in the Palace Hotel by the Peterhead Electric Co. Provost Max Schultze and Councillor Mrs. Cuthbert, convener of the Lighting Committee, commented in cordial terms on the excellence of the new lighting system. Dr. D. M. McKechnie, manager, responded on behalf of the Peterhead Electric Co.

**Sheffield.**—MAINS.—The Electricity Committee is to extend mains at a cost of £32,737.

NEW PLANT.—Sanction is being sought by the Electricity Committee to a loan of £404,706 for extensions to generating plant and buildings at Blackburn Meadows power station.

**Stockport.**—EXTENSION OF GENERATING STATION.—It is proposed to extend the Millgate generating station by the installation of a 30,000-kW turbo-alternator and three 150,000 lb.-per-hr. boilers, at an estimated cost of £393,358.

**Stockton-on-Tees.**—REDUCTIONS.—Remarking that the net profits of the undertaking justified such a course, the borough electrical engineer and manager (Mr. S. G. Marston) recommended reductions in charges amounting to £9,218 per annum at a recent Town Council meeting. Mr. Marston added that the proposed reductions in the lighting, slot meter, and domestic tariffs would benefit the large mass of small users, while the small-power user would gain by the alteration of the power rate. The concessions were approved.

**Tonbridge (Kent).**—EXTENSIONS.—The Urban District Council is to carry out extensions at an estimated cost of £5,621.

**Torquay.**—LOANS.—Sanction is being sought to a loan of £10,000 for switchgear and transformers.

SUPPLY TO BROADCASTING STATION.—The Electricity Committee has arranged to provide a supply to the British Broadcasting Corporation's South-West Regional Station.

**West Bridgford.**—SODIUM LIGHTING.—Twenty-three 150-W "Philora" sodium lamps in Wardle "Solux" units have recently been installed along the busy main road into Nottingham. The scheme was prepared in conjunction with the engineer and surveyor, Mr. H. Carmichael.

**Workington.**—SUPPLY TO ESTATE.—The Electricity Committee is to lay mains and erect a sub-station on the Laverock Hall estate, at a cost of £4,000.

**Worthing.** — CONSUMERS TO BENEFIT. — Introducing the accounts of the electricity undertaking at a recent meeting of the Town Council, Coun. A. C. Jackson said that there was a profit of £23,256, and it was proposed to reduce the flat rate by ½d. a kWh, and the running charge of the two-part (business premises) tariff by ½d. Producing the budget for next year, he said that, after giving £15,000 in reduced charges, they would have a small surplus. He complained of the amount they had to pay in income-tax (£5,000), and said that in future they would consider their consumers first.

# Traction

**Blackpool.**—NEW TRAMCARS.—Twenty new luxury tramcars will shortly be in service at Blackpool. They have rubber shock-absorbers, electrically operated sliding doors, and sliding roofs. There is rubber flooring and pneumatic upholstery. The lighting is also a feature. They are part of a five-year plan for reorganising the transport undertaking.

PROFITABLE TRANSPORT SYSTEM.—The Corporation trams and buses carried 71,302,227 passengers in 1936-37, or nearly 5½ millions more than in the previous year. The profit on the trams was £52,973 and on the buses £19,611.

**South Africa.**—EXTENSIVE RAILWAY ELECTRIFICATION.—In our issues of June 18th and 25th last we published articles describing the Witwatersrand (Reef) and Natal railway electrification schemes. From the aspect of the power supply, further details are given in the annual report of the Electricity Supply Commission for 1936. For the system along the Witwatersrand (ninety-five miles) and from Germiston to Pretoria (thirty-six miles) the Commission is providing twelve mercury-arc rectifier sub-stations, aggregating 49,580 kVA, and fifteen route miles of 40,000-V single-circuit three-wire transmission lines. The entire system is expected to be electrically operated by next November. The section of the Natal main line between Glencoe and Volksrust is expected to be operated electrically by the end of the current month. This will complete the conversion of the whole of the main line (326 route miles) from steam to electric traction, and will constitute the most extensive main-line electrification in the British Empire. The plant and equipment provided by the Commission in connection with the Cato Ridge-Durban and Glencoe-Volksrust sections include eleven mercury-arc rectifier sub-stations, aggregating 29,260 kVA, and 163 route miles of single-circuit, three-wire, 88,000-V transmission lines. The whole of the South African Railways and Harbours Administration's electricity requirements for traction purposes in Natal, which, in 1936, amounted to 139,195,138 kWh, are being supplied from the Commission's power station at Colenso. The construction of the sub-station buildings, the installation of the rectifier plant, and the erection of the transmission lines required in connection with the Reef railway electrification scheme and the extensions in Natal, are being carried out on behalf of the Commission by the Railway Administration's electrical staff. Various construction difficulties have been encountered. For instance, the transmission line had to be taken from the precipitous heights above Delville Wood tunnel to the Cato Ridge-Durban track below, across a deep gorge some 1,500 ft. wide. The obstacles in the way of running out the line by hand and negotiating the ravines and dense bush were practically insurmountable. By means of a rocket gun, a life line attached to the power line was shot down to the track and then hauled across.

**Irish Free State.**—DUBLIN TRAFFIC SIGNALS.—The Free State Minister for Industry and Commerce has refused to accede to the Corporation's request for free importation of the signals shortly to be erected as an experimental measure at an important city junction. The cost of supplying and installing signals will be £891, and the Minister for Local Government has agreed to the charging of £500 of this to the Road Improvement Grant. In support of its application the Corporation stated that the apparatus was not manufactured in the Free State. The duty amounts to £64.

**South Shields.**—INCREASED REVENUE.—The total revenue of the Transport Department, of which Mr. H. Muscroft is the manager, during the year ended March 31st last was £92,910, against £85,680 in the previous year, the gross profit being £25,919 (£22,775). An event of importance was the inauguration of the first trolley-bus service in October; since the close of the financial year there has been further conversion from tram to trolley-bus operation. The number of passenger-journeys last year increased by 7 per cent. to 19.3 millions.

TUBE SCHEME ABANDONED.—The South Shields and Tynemouth Corporations have been informed by Arthur Whitley, Ltd., that the company does not now intend to promote a Bill for the construction of a Kearney tube railway under the Tyne. The Corporations stated their intention of opposing any scheme which did not provide for both vehicular and pedestrian traffic.

**United States.**—NEW TROLLEY COACH SYSTEM.—On July 10th the Cincinnati, Newport and Covington Railway Co. inaugurated a system of trolley-coaches which is believed to be the only one in the country to use a terminal building, according to *Mass Transportation*. This building, at Cincinnati, is divided into two levels, the upper floor being entered direct, by means of ramps, from the suspension bridge connecting Cincinnati and Covington. The lower level is used by trams from Newport. The terminus, while it is an advantage to passengers, caused many complications in preparing for trolley-coach service. Open track had been used formerly for trams, both in the terminus and on the ramps. It was necessary to raise all track to pavement height, and then pave the entire ramp, as well as the loop in the terminus. The Cincinnati, Newport and Covington Railway operates from Cincinnati to a group of communities in Northern Kentucky. Of the twelve Kentucky communities, Covington and Newport are the largest. The twenty-one new trolley-coaches are 40-passenger Brill vehicles, with single-motor General Electric equipment.

# Communications

**Argentina.**—RADIO DEVELOPMENT.—According to the *Review of the River Plate*, the National Government has issued a decree, approved in Cabinet Council, granting an extraordinary credit to the Department of Posts and Telegraphs for 1,283,000 pesos paper for the extension of the national system of radio communications.

**Germany.**—RADIO SHOW.—Radio programmes relayed to telephone subscribers form one of the novel features of this year's Radio Exhibition, states *Reuter*. The German Postal Authorities are making a special display of receiving apparatus for this system, which they have devised especially for the benefit of centres which suffer from electrical interference. The Post Office will re-transmit programmes from local broadcasting stations over the telephone system, using a range of high frequencies. Special devices on show at the exhibition enable even the cheapest sets to be connected with the telephone system. Three or more programmes can be sent simultaneously over one telephone line, and a tuning device enables any of these to be selected. It is claimed that Germany is the only country at present using this system, though France, Switzerland and Holland have a similar system using low frequencies. A large section is devoted this year for the first time to television. Telefunken are exhibiting television broadcasting apparatus employing two cameras in one studio, thus enabling different views to be blended. The television studios have been built alongside the receiving sets at the exhibition, so that spectators can watch both progressing simultaneously. It is claimed that the present exhibition is the largest television show in the world.

**Great Britain.**—NEW BROADCASTING STATION.—The Duchess of Northumberland is to declare open the new B.B.C. transmitting station at Stagshaw, Northumberland, in October. The new station will take over the Newcastle wavelength (267 metres).

AUTOMATIC TELEPHONY.—The Widnes telephone exchange is to be changed over to automatic operation on August 28th.

**India.**—RADIO LICENCES.—Recent statistics show that the present number of radio licences in India is about 45,000, of which nearly 25,000 were issued during the past year.

BROADCASTING IN TRAVANCORE STATE.—The Government of Travancore has under consideration the provision of a broadcasting station for serving the whole State, and for this purpose Rs.1½ lakhs has been included in the Budget for next year.

# Contract Information

**Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses**

## Contracts Open

**Aberdeen.**—August 17th. County Council Education Committee. Electric wiring and heating engineering work at Meldrum Commercial Road school and new schoolhouse at Old Meldrum. G. Gray, architect, Inverurie.

August 18th. Directors of the Royal Mental Hospital. Rewiring and renewal of the electric lighting installation at the Hospital. J. B. Nicol, architect, 367, Union Street.

**Aldershot.**—August 31st. Borough Council. Electric wiring at seventy-eight houses at Aldershot Park. (August 6th.) Transformers and one transforming kiosk with switchgear. (See this issue.)

**Australia.**—MELBOURNE.—August 31st. Posts and Telegraphs Department. Telephone accessories. (T. 18024/37.)*

October 12th. State Electricity Commission of Victoria. Switchgear, including compound-filled circuit-breakers, current transformers and accessories. (T. 25684/37.)*

September 6th. City Council. Electrically driven centrifugal pump and spares. (T.Y. 25943/37.)*

MILDURA (VICTORIA).—September 15th. Electricity Supply Department. Switchgear. (T.Y. 25942/37.)*

BRISBANE.—September 20th. City Electric Light Co. Feeder panels. (T.Y. 25700/37.)*

**Barrow-in-Furness.**—August 23rd. Gas and Water Department. Two sets of electrically driven centrifugal pumps for an output of 2,750 gal. per min. against a head of 140 ft., together with transformers, rectifiers, switchgear, pipes, valves, &c. Engineer and manager, Gas and Water Department, Salthouse Gasworks (deposit £2 2s.).

**Biggleswade.**—August 31st. Water Board. Two motor driven vertical spindle multi-stage borehole centrifugal pumps, each of 18,000-gal. per hr. capacity and two similar pumps, each of 14,400-gal. per hr. capacity; one heavy-oil engine with d.c. generator to provide electricity for pumping 50,400-gal. per hr., and two similar engines and d.c. generators, each of not less than half the power of the larger unit, together with accessories; alternatively, four small oil engine generating units. Particulars from Binnie Deacon & Gourley, Artillery House, Artillery Row, London, S.W.1 (deposit £5), by August 20th.

**Birmingham.**—September 10th. Electric Supply Department. Domestic electrical apparatus for one year. (See this issue.)

September 3rd. Public Health and Maternity and Child Welfare Committee. Three bed lifts at the new Isolation Blocks, Little Bromwich Hospital. Particulars from F. H. C. Wiltshire, town clerk, Council House (deposit £2 2s.), by August 20th.

**Burnley.**—August 16th. Corporation. Electrical wiring in connection with the extensions to the Municipal College. (August 6th.)

**Cannock.**—August 24th. U.D.C. Electric lighting installations in connection with 196 houses on sites at Cannock, Chadsmoor and Hednesford. W. C. Speedy, clerk of the Council, Council House.

**Cardiff.**—August 17th. King Edward VII Welsh National Memorial Association. Wiring for radio installation at the Glan Ely Hospital. F. J. Alban, secretary, Memorial Offices, Westgate Street.

September 13th. R.D.C. Electricity Department. Four 25-kVA and six 10-kVA transformers; and construction of e.h.v. and l.v. overhead lines. (See this issue.)

**Cheddleton.**—September 6th. Mental Hospital Committee. Six months' supply of electric lamps. G. Lawton, clerk, Cheddleton Mental Hospital, near Leek, Staffs.

**Chelmsford.**—August 23rd. Education Committee. Electric lighting and power installation at the Moulsham senior, junior and infants' schools, Princess Road. H. W. Allardyce, architect, Clock House Chambers, Barking (deposit £5).

**Chesterfield.**—August 27th. Electricity Department. Six miles of e.h.v. and l.v. cables and two outdoor-type transformer kiosks. (See this issue.)

**Cleethorpes.**—September 11th. Borough Council. H.v. switchgear. (See this issue.)

**Denmark.**—COPENHAGEN.—August 27th. Lighting Department. Electrically driven boiler feed pumping set. (T.Y. 18046/37.)*

**East Grinstead.**—August 25th. U.D.C. P.i., l.c. and armoured cables for the period ending August 31st, 1938. (August 6th.)

**Erith.**—August 16th. U.D.C. Re-wiring of electric lighting installation and wiring for plug points at the Northumberland Heath junior and infants' school. (August 6th.)

**Essex.**—September 6th. County Council Education Committee. Electrical installation at the South-West Technical College, Walthamstow. (See this issue.)

**Heston and Isleworth.**—September 7th. Borough Council. Fire protection equipment at the Electricity Works, Bridge Road, Hounslow. (See this issue.)

**Ilford.**—August 27th. Electricity Department. One 500-kW rectifier equipment, comprising two 250-kW units for traction supply. (August 6th.)

**India.**—SIMLA.—August 28th. Stores Department. Electric lamps for the beacon and floodlighting installations at the civil aerodromes in India and Burma. (T. 25702/37.)*

**Irish Free State.**—DUBLIN.—August 31st. Electricity Supply Board. Tools for one year. (See this issue.)

**Kingston-upon-Thames.**—August 30th. Corporation. P.i. cables. (July 30th.)

**Leighton Buzzard.**—August 19th. U.D.C. Vertical centrifugal borehole and booster pump (12,000 g.p.h. capacity), with electric motor, metering equipment, &c. Sands & Walker, consulting engineers, Milton Chambers, Nottingham (deposit £2 2s.).

**London.**—COMMISSIONERS OF WORKS.—August 24th. Generating plant, including back-pressure turbo-generators, switchgear, transformers, cables, &c. Room 65D, 3rd Floor, H.M. Office of Works, S.W.1 (deposit £1).

HACKNEY.—September 29th. Borough Council. Water-cooling tower. (August 6th.)

ISLINGTON.—September 8th. Borough Council. Electric wire, conduits and accessories; and installation of electric lighting in blocks of dwellings. (August 6th.)

September 14th. Street lamp columns and lanterns. (See this issue.)

**Macclesfield.**—August 18th. Corporation. Electric lighting in connection with the extensions to the Isolation Hospital, Moss Lane. (August 6th.)

**Manchester.**—August 20th. Waterworks Committee. Three electrically driven multi-stage centrifugal pumps, with automatic control and switchgear, pipes, valves, &c. Chief engineer, Waterworks Offices, Town Hall (deposit £1 1s.).

August 20th. Electricity Committee. H.p. steam valves. (August 6th.)

August 25th. L.p. valves, circulating water pumps and automatic equipment for controlling four boilers. (August 6th.)

August 27th. H.p. steam pipes and receiver. (August 6th.)

August 20th. Corporation. Three new service lifts at the Victoria Hotel. R. D. M. McKinley, engineer, Spiers & Pond, Ltd., 35, New Bridge Street, London, E.C.4 (deposit £1 1s.).

**Middlesex.**—September 6th. County Council. Cooking equipment at the Redhill County Hospital. (August 6th.)

**New Zealand.**—WELLINGTON.—August 31st. Post and Telegraph Department. Telephone cable. (T. 25593/37.)*

November 23rd. Public Works Department. 5,000-kVA transformers. (T.Y. 25997/37.)*

September 28th. 40-kW direct-coupled engine driven generating set and accessories. (T.Y. 25999/37.)*

CHRISTCHURCH.—September 9th. Electricity Department. 200-kVA transformers. (T. 18008/37.)*

**Northern Ireland.**—BELFAST.—August 20th. Electricity Committee. Pumping equipment, mixing tank and pipework at the Harbour power station. (August 6th.)

**Portsmouth.**—September 2nd. Electricity Undertaking. 33-kV switchgear at the generating station. (July 30th.)

**Portsoy** (BANFFSHIRE).—August 17th. Town Council. Electric street lighting equipment. Burgh surveyor.

**Preston.**—September 3rd. Corporation. Electrical wiring at the Preston Institution, Fulwood. (July 30th.)

**Prestonpans.**—August 24th. Town Council. Electric lighting at fifty-four houses. R. and A. K. Smith, surveyors, 4, Forres Street, Edinburgh, 3.

**South Africa.**—JOHANNESBURG.—September 18th. Electricity Department. Iron-cored oil-immersed current-limiting reactors and associated equipment. (T.Y. 25820/37.)* Automatic convertor equipment. (T. 25819/37.)*

August 21st. Two 2,000-kW synchronous motor convertors and associated equipment for the President Street and Central sub-stations. (T. 25821/1937.)*

September 11th. City Council. Electricity meters. (T. 18080-37.)*

CAPE TOWN.—August 25th. Electricity Supply Undertaking. Transformers. (T. Y. 25719/37.)*

September 1st. Electricity Supply Commission. Cables. (T.Y. 18252.)*

PRETORIA.—September 10th. Union Tender and Supplies Board. Telephone switches. (T. 18085/37.)*

September 17th. Switchboard wire. (T. 18242/37.)*

**Stourbridge.**—Stourbridge and District Water Board. Two electrically driven turbine pumps. W. B. Cleverly, engineer and manager, 7, Lower High Street.

**Sunderland.**—August 30th. Corporation. Cables, wire, meters and lamps for twelve months. (August 6th.)

**West Ham.**—September 6th. Borough Council. Transformers, wires and cables and meters for twelve months. (See this issue.)

**West Riding.**—August 16th. Mental Hospital Board. Wiring in connection with the installation of electric lighting in the Admission Hospital and two convalescent villas at the Menston Mental Hospital, near Leeds. W. E. H. Burton, architect and engineer to the Board, Mental Hospital, Wakefield (deposit £2 2s. to the clerk of the Board, Victoria Chambers, Wood Street, Wakefield).

August 30th. County Council. Electric lighting and l.p. hot-water apparatus at Thorne Moorends new infants' school. Education officer, County Hall, Wakefield.

**Whiston.**—August 18th. R.D.C. Automatic electrically operated sewage pumping plant, one set of electrically operated automatic screening plant, three revolving sewage sprinklers, valves, pipework, &c., for the Halewood sewerage scheme. H. B. Ward, 26, North John Street, Liverpool, 2 (deposit £5 5s. in each case).

**Windsor.**—August 26th. Borough Council. Street poles, lanterns, h.p. mercury vapour lamps, time switches and electrical equipment. (See this issue.)

**Workington.**—August 21st. Corporation. One 200-kVA and one 100-kVA transformers. (August 6th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

# Contracts Closed

**Barnstaple.**—Town Council. Accepted. Three sub-stations (£2,190).—Electric Construction Co.

**Barrow-in-Furness.**—Electricity Committee. Accepted. Grit plant (£190).—Davidson & Co. Coal plant (£140).—C. H. Johnson & Sons. E.h.v. line to Bouth (£1,265).—Johnson & Phillips.
Cleansing Committee. Accepted. Two electric vehicle batteries (£344).—D.P. Battery Co.

**Birmingham.**—Town Council. Accepted during the period from May 21st to July 13th: Underground cable in connection with the installation of X-ray apparatus at Erdington House.—Reynolds & Bradwell. Electric lighting, power and bell installation at the Victoria Law Courts.—T. Glover. Electric power and lighting in the maids' home and nurses' home extensions and other buildings at the City Isolation Hospital, Little Bromwich.—W. L. Horrobin.

**Dundee.**—Housing Committee. Accepted. Electrical work in connection with 138 houses being erected at Beechwood (£1,340) and twelve shops at Mid Craigie centre.—Stenson & Co.

**Fife.**—Joint Asylum Committee. Accepted. For the extension of the Fife Joint Asylum: Electrical plant (£5,659).—J. Scott & Co.

**Glasgow.**—Electricity Committee. Accepted. Two electrically driven box-type capstans for wagon haulage at Dalmarnock generating station (£860).—Clarke, Chapman & Co.
One 14-ton tractor (£914).—Electricars, Ltd. One 30-cwt. and two 15-cwt. vans (£397).—Victor Electrics, Ltd.
Committee on Printing and Stationery. Accepted. Electric air extracting fans at the municipal printing works.—James Keith & Blackman Co.; Utilities (London).

**Holywell.**—U.D.C. Accepted. Electrical work at fifty houses being erected in the Strand (£261).—S. Wolfenden.

**Hull.**—Telephones Committee. Accepted. Bronze wire (£483).—B.I. Cables.
Education Committee. Accepted. Electrical installations at Endyke Lane junior school (£257) and Fountain Road Centre (£496).—T. A. Garness.

**Leeds.**—Housing Committee. Accepted. Electrical installation at cottage flats on various estates (£1,194).—H. H. Tordoff.
Electricity Committee. Accepted. Cables.—Henley's (£2,101): B. I. Cables (£1,717); Edison Swan Cables (£1,365); Enfield Cable Works (£806); Crompton Parkinson (£192).

**London.**—SOUTHWARK.—Health Committee. Recommended. Solarium equipment at Health Centre (£249).—Watson & Sons.
Works Committee. Traversing, raising and lowering gear:

| | £ | | £ |
|---|---|---|---|
| Engineering & Lighting Equipment Co. (Quotation for only part of tender) ... ... | 739 | **Siemens Electric Lamps and Supplies. Recommended** ... | **1,326** |
| | | London Electric Firm ... ... | 1,380 |
| | | General Electric Co. ... ... | 1,531 |

Street lighting poles:

| | £ | | £ |
|---|---|---|---|
| **Newport and South Wales Tube Co. Recommended** ... ... | **2,605** | Globe Tube and Engineering Works, John Spencer, Ltd. ... | 2,731 |
| Bromford Tube Co. ... ... | 2,669 | Revo Electric Co. ... ... | 2,858 |
| Siemens Electric Lamps and Supplies... ... ... ... | 2,690 | British Thomson-Houston Co. ... | 2,937 |
| Stewarts & Lloyds ... ... | 2,742 | General Electric Co. ... ... | 3,188 |

L.C.C.—Electrical work at the Ashford Residential School, Middlesex:

| | £ | | £ |
|---|---|---|---|
| **City Electrical Co. Accepted** ... | **2,723** | Holliday Hall & Stinson ... | 3,468 |
| A. Meckhonik ... ... ... | 3,200 | Atozed (Kingston) ... ... | 3,470 |
| Blackburn Starling & Co. ... | 3,335 | Electrical Installations, Ltd. ... | 3,577 |

Wiring and fittings for electric lighting, &c., in the Munster Road school, Fulham, W.:

| | £ | | £ |
|---|---|---|---|
| **Holliday & Son (Electrical). Accepted** ... ... ... ... | **1,200** | Berkeley Electrical Engineering Co. ... ... ... ... | 1,334 |
| Carr Bros.... ... ... ... | 1,214 | Read & Partners ... ... | 1,394 |
| Electrical Installations, Ltd. ... | 1,314 | E. C. Stokes, Ltd. ... ... | 1,447 |
| Buchanan & Curwen ... ... | 1,322 | Springvale Electrical Co. ... | 1,652 |
| Archibald Meckhonik ... ... | 1,340 | | |

ST. MARYLEBONE.—Works Committee. Recommended. Traffic signals at ten junctions (£7,451).—Siemens & General Electric Railway Signal Co.

**Manchester.**—Housing Committee. Accepted. Electrical installations in 978 houses and flats on the Booth Hall estate, Blackley.—H. C. Taylor & Co.

**Scarborough.**—Town Council. Accepted. Three-phase, 11,000-V overhead line in connection with the extension of the electricity service to the Hackness area (£1,029).—Johnson & Phillips. Switchgear for the Irton Waterworks sub-station (£168).—Met.-Vick. Elecl. Co.

**Sheffield.**—Electricity Committee. Accepted. Switchgear for Blackburn Meadows power station (£53,297).—A. Reyrolle & Co. Copper condenser tubes (£3,010).—Yorkshire Copper Works.

**South Shields.**—Transport Committee. Accepted. Six trolley vehicles (£2,150 each).—Karrier Motors, Ltd.

**Stirling.**—County Council. Accepted. Electrical work in connection with the erection of twenty-two houses at Causewayhead (£284).—Greig Bros.

**Wolverhampton.**—Transport Committee. Accepted. Eighty steel traction poles (£595).—Newport and South Wales Tube Co.

# Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

PYROBEST asbestos-covered flexibles.

Readers should enclose stamped addressed envelopes when making their inquiries.

# Notes

## Depreciation of Purchased Undertakings

The Stationery Office has published (1d. net) a draft Order made by the Electricity Commissioners laying down a scale to be applied in arriving at the amount of depreciation for the purpose of ascertaining the payment to be made by an electricity supply authority purchasing the undertaking of another Authority under Section 39 (1) of the Electricity (Supply) Act, 1926. The Order has been confirmed by the Minister of Transport and will come into force when it has laid before Parliament in session for thirty days unless an address is presented against it.

## E.A.W. Examination Results

For the first time the summer school of Electrical Housecraft for domestic science teachers, organised by the Electrical Association for Women, is to be held in Scotland—at the Glasgow and West of Scotland College of Domestic Science from August 26th to 31st. Among the interesting functions arranged will be a visit to the Royal Technical College, Glasgow, to hear a lecture by Professor S. Parker Smith, one of the pioneers of domestic electrification. At the guest night dinner on August 30th a number of well-known people are expected to be present.
There were sixty-nine entrants for the Electrical Association for Women's summer examination for the electrical housecraft certificate for teachers held on June 12th in London and twelve provincial centres. Sixty were successful, nine with distinction, this bringing the total number of holders of certificates to 358. Of the 109 candidates for the electrical housecraft certificate for demonstrators held on June 17th seventy-three passed, six with distinction, bringing the number of certificate holders to 469. The next examination for demonstrators will be on December 16th and that for teachers on January 15.

## Locating Buried Cables by Radio

Such tasks as locating underground cables ahead of trenching machines can be done by a new radio device, says the *Electrical World*. The apparatus, known as the "Fisher M-Scope," consists of two self-contained radio units, both battery operated. A low-power transmitter operating on 175 kc. is self-modulating with an audio frequency of 1,000 cycles. It sends out waves which are induced in the underground cable when the transmitting loop aerial is placed vertically parallel to and over it. These waves travel along the cable for a limited distance and can be picked up by the receiver in three ways: (1) Assembled with the receiver horizontal and the transmitter vertical, the operator walks over the area to be surveyed, a mark being made at the point where the maximum tone is heard in the headphones and the minimum reading obtained on a plate-current milliammeter in the last audio-stage of the receiver. The operator then retraces his steps and again makes a mark at the point of maximum tone and minimum reading. Half the distance between these marks is over the centre of the object being located. (2) With the receiver and transmitter separated and each carried vertically and parallel the operators walk across the street, keeping 40 ft. apart and equidistant from the same curb. Maximum tone is again heard when the transmitter and receiver are over the cable. The transmitter is then placed on the ground over the cable and parallel to it and the operator with the receiver backs away from it along the cable, marking its position as he goes at points where maximum tone is heard. (3) With the receiver held horizontally instead of vertically the minimum tone volume indicates the position of the object.

## Electric Iron Fatality

An inquest was held at Rotherham on August 6th on Mrs. Mabel A. Cooper, aged thirty-five, of Parkgate, who died from electric shock. Dr. E. A. Mankin said that on the second and third fingers of each hand there were burns such as would be caused by electric current. Other witnesses stated that Mrs. Cooper was found lying on her back holding a piece of insulated cable in her left hand and a small screwdriver in her right hand. There was an electric iron on the table and some ironed clothes. One of the terminal wires of the cable was broken, and the lighting system of the house had been put out of action. Mr. W. Redmayne, assistant to the Rotherham borough electrical engineer, said he examined the cable and the iron. He thought that Mrs. Cooper had been trying to repair a break in the flexible cord without switching off the current. A verdict of "Death by misadventure" was returned.

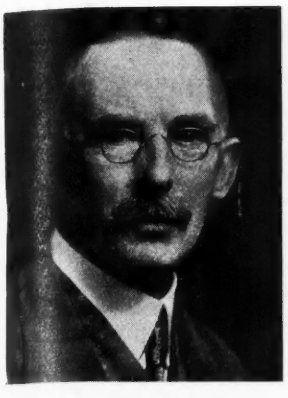
## Appointments Vacant

Borough electrical engineer for Barrow-in-Furness.
Lady trainee for Cheltenham electricity undertaking.
Draughtsman, installer and test engineer for Radio Transmission Equipment, Ltd.
Lady demonstrator and showroom attendant for Leyton Electricity Department.
Assistant installation and consumers' engineer, meter test room superintendent and first mains assistant for Barking Electricity Supply Department.
Distribution engineer for Grimsby Electricity Department.
Maintenance electrician for Thurrock U.D.C.
Lady showroom attendant for Mirfield Electricity Department.
Senior technical officer in the Admiralty Technical Pool.
(See our classified advertisements.)

# Our Personal Column

**Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements**

**Mr. C. C. Paterson,** O.B.E., director of the Research Laboratories of the General Electric Co., Ltd., has had conferred on him by Birmingham University the honorary degree of Doctor of Science "in recognition of his many contributions and services to electrical science." Dr. Paterson, who is now fifty-seven, was for sixteen years a member of the staff of the National Physical Laboratory where he established and administered the electrotechnics and photometry divisions of the Laboratory until 1918. He then accepted the task under Lord Hirst of initiating the G.E.C. laboratories at Wembley. Dr. Paterson was president of the Institution of Electrical Engineers in the year of the Faraday celebrations. He has been president of the International Illumination Commission, the Junior Institution of Engineers, the Illuminating Engineering Society, and this year of the Institute of Physics; he is also a vice-president of the Royal Institution and of the Royal Society of Arts. He has been Faraday lecturer of the I.E.E., Huxley lecturer of Birmingham University, and is this year Guthrie lecturer of the Physical Society. He is a member of the Main Committee of the Engineering Standards Association, is chairman of several B.S.I. committees and of the Illumination Committee of the Department of Scientific and Industrial Research, is on the Executive Committee of the N.P.L., and has served on several Government departmental committees. While Dr. Paterson's activities in engineering and science have covered a wide range, his chief personal contributions and scientific papers have been in the fields of light and lighting. He has written on these subjects in the ELECTRICAL REVIEW from time to time.



**Dr. C. C. Paterson**

[*Basil, London*

**Mr. H. S. Fothergill**

**Mr. H. Senior Fothergill,** A.S.A.A., who has been appeals secretary to the National Institute for the Blind for the last eight years, has been appointed by the Electrical Industries Benevolent Association to fill the post recently vacated by Mr. A. H. Seabrook.

The wedding took place on August 5th of **Mr. R. G. Widgery,** electrical engineer to the Shipley Urban District Council, and Mrs. Alice M. Thomas, of Gilstead.

**Mr. B. W. Harding,** of Bromley, has been recommended by the Southwark Borough Council Electricity Committee for the appointment of consumers' engineer.

The wedding is announced to take place on August 21st of **Mr. E. M. Selley,** sales engineer to Venner Time Switches, Ltd., and Miss Gwendoline Audrey Filkin. After the honeymoon, to be spent on the Continent, they will reside at Cheltenham, Glos.

Following his appointment as general manager, **Mr. W. V. Waite,** O.B.E., M.I.Mech.E., has been appointed to the board of F. E. Tranter & Co., Ltd.

**Mr. W. J. H. Penman,** of Lancaster, has been appointed transport manager to the Darlington Corporation at a salary of £700, rising to £750 per annum.

**Mr. F. A. Simpson,** A.M.I.E.E., who has been the manager and engineer of the Newmarket Electric Light Co. since its inauguration, is retiring on superannuation on October 1st after nearly forty years' service.

**Mr. D. Powell** has been appointed charge engineer in the power house of Ford's Motor Works, Dagenham. He previously held a similar position in the Wimbledon Corporation electricity works.

**A.S.E.E. Awards.**—The judges appointed by the Executive Council of the Association of Supervising Electrical Engineers have announced their decision in connection with the competition during the 1936-37 session for the meetings discussion award. The first prize of £5 goes to Mr. G. Jelley and the second prize of £2 10s. to Mr. H. Pudney. The cheques will be presented to the winners at the opening meeting of the 1937-38 session, which takes place on October 19th next. For the 1936-37 session the judges were Mr. H. Hobson, president; Mr. J. Southern, chairman; Mr. C. W. Bullock, Executive Council; Mr. W. Rowland, member; and Mr. A. Brammer, general secretary.

**Mr. G. H. Sammons,** distribution engineer to the Grimsby Corporation Electricity Department, was on August 4th selected by the Blackburn Corporation Electricity Committee as chief assistant electrical engineer in succession to Mr. A. Latham, who has been appointed engineer and manager to the Mansfield electricity undertaking. The Blackburn post, for which there were over fifty applicants, carries a salary of £633. Mr. Sammons was formerly at Manchester, Hampstead, Wolverhampton, and Birmingham.

**Mr. G. H. Sammons**

**Mr. C. S. Cloughton,** mains engineer with the Ealing Electricity Department, was married on August 2nd at Felsted Congregational Church, Essex, to Miss Eileen E. Budwell.

The South West England and South Wales Area grid staff met informally at Bristol on July 28th to express good fortune to **Mr. W. H. Dunley,** their colleague, who takes up an appointment in Hull this month. After dinner, a presentation was made by Mr. J. T. H. Legge, who presided. Mr. Dunkley, who was toasted with musical honours, replied, and for the guests Mr. I. A. D. Pedler (Bristol) responded. Other guests present included Messrs. A. Rees (Swansea), S. M. Hill (Bristol), G. H. Bulman (Cardiff), T. H. Wood (Newport), E. G. Hooper (Southampton), R. J. Ferris (Swindon), R. H. Bent (Oxford), A. H. French (Gloucester), and T. S. Wallis and H. C. Haskins (Bristol).

A gathering assembled for lunch at the Waldorf Hotel on July 22nd to honour **Mr. F. K. Jewson,** who on that date completed forty years' service with Standard Telephones and Cables, Ltd. In presenting him with his forty-year badge, Mr. F. Gill, chairman of the company, referred to the unfailing loyalty that Mr. Jewson had always shown to the company and to his colleagues, to the knowledge he possessed of the company's manifold interests, and to his remarkable memory. Messrs. E. A. Brofos, P. E. Erikson and T. G. Spencer

**Mr. F. K. Jewson receiving his forty-year badge from Mr. F. Gill, chairman of Standard Telephones & Cables, Ltd.**

(managing director) added their tributes to the zeal displayed by Mr. Jewson over so many years. In replying, Mr. Jewson referred to some of his experiences when in the Engineering Department of the Western Electric Co. Of the company present, Messrs. E. A. Brofos, S. M. Catterson, P. E. Erikson,

C. W. Eve, F. Gill, A. T. Gillanders, B. B. Grace, C. W. Jacobs, T. F. Lee, A. M. Searle and T. C. Spencer, between them, have completed 366 years' service with the company, an average of over thirty years each.

**Mr. B. Irving** has been elected to the board of Worthington-Simpson, Ltd.

**Mr. R. J. Pettitt,** sales manager of B.E.N. Patents, Ltd., has been appointed a director of the company. Mr Pettitt joined the firm in 1927, having previously been on the staff of R. Cadisch & Sons in the capacity of sales manager.

## Obituary

**Mr. L. Lucas,** a member of the staff of the Northern Electric Co., of Montreal, died recently at the age of forty. Born at Annan, Dumfriesshire, he served his apprenticeship with Mavor and Coulson, Ltd. After war service he went to Canada, and among other positions which he held before joining the Northern Electric Co. were those of superintendent of plant and transmission lines with the Great Northern Power Co. at Indian Chutes, Ont., and plant manager for the Northern Canada Power Co., Ltd., Timmins, Ont.

**Mr. C. R. Heron.**—The death is announced of Mr. Cyril Renton Heron, M.B.E., A.M.I.E.E., which occurred on August 5th.

**Mr. W. L. Edison.**—The death has occurred of Mr. William Leslie Edison, eldest son of the late Thomas Alva Edison, at Wilmington, U.S.A., at the age of fifty-eight. Mr. Edison had devoted himself to wireless inventions.

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**Will.—Mr. W. Sams,** a director of the Bognor Gas and Electricity Co., left estate valued at £50,848, with net personalty £43,283.

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# Financial Section

**New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares**

## New Companies Registered

**South Eastern Rentals, Ltd.**—Private company. Registered July 31st. Capital £10,000. Objects: To carry on the business of designers, manufacturers, exporters, importers and distributors of, agents for and dealers (whether on instalment plan or hire-purchase or easy payment plan or otherwise) in radio, television, and electrical apparatus and appliances, &c. The directors are: J. E. Ball, Glen Lyn, St. Albans Road, Clacton-on-Sea, and J. W. Field, Brooklyn, Canterbury Road, Herne Bay.

**Radiant Neon, Ltd.**—Private company. Registered August 7th. Capital, £800. Objects: To acquire the business of electricians and neon sign manufacturers carried on by R. Belot and W. Green as "The Crown Neon Co.," at The Crown Works, Burnley Road, Dudden Hill Lane, London. The permanent directors are: R. Belot, 82, Eton Avenue, Wembley, W. Green (chairman and managing director), 224, Walm Lane, Cricklewood, N.W.2, and A. Reissner, 7, Orme Court, Bayswater, W.2. Registered office: Crown Works, Burnley Road, Dudden Hill Lane, N.W.10.

**R. G. Poole, Ltd.**—Private company. Registered August 7th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in wireless and television apparatus and accessories, &c. The permanent directors are: R. G. Poole, 19, Tower Road, Nab Wood, Shipley, and L. Bacon, 2, Cyprus Drive, Thackley, Bradford. Solicitors: Banks, Newell, Demaine & Calvert, Bradford.

**Gibson Weaver & Co., Ltd.**—Private company. Registered August 7th. Capital, £1,000. Objects: To carry on the business of electricians, mechanical engineers and manufacturers and workers of and dealers in electricity, motive power and light, &c. The permanent directors are: J. Gibson, 76, Caebricks, Manselton, Swansea, and G. A. Gibson, Fairfield, Overland Road, Mumbles, Swansea. Solicitors: Roger Williams, Rutland House, Rutland Street, Swansea.

**J. W. Wright (Nottm.), Ltd.**—Private company. Registered August 6th. Capital, £2,000. Objects: To carry on the business of importers and exporters of and wholesale and retail dealers in and agents for wireless and television instruments and apparatus, &c. The directors are: J. W. Wright (permanent managing director), and E. S. Wright, both of 41, Wilford Road, Nottingham.

**Ardente Acoustic Laboratories, Ltd.**—Private company. Registered August 6th. Capital, £10,000. Objects: To carry on the business of electrical engineers and contractors, manufacturers of radio, public address and television apparatus, manufacturers of telephones, telegraphs, &c. The subscribers are: H. L. Bloom, 79, Aberdare Gardens, N.W.6, and Miss A. P. Walsh, Fanningstown. Hillside, Banstead, Surrey. Solicitors: Nickinson & Co., 42, Bedford Square, W.C.1.

**Ideal Rental Services, Ltd.**—Private company. Registered August 3rd. Capital, £1,000. Objects: To carry on the business of letting out on rental radio receivers, domestic electrical appliances, refrigerators and similar articles of common domestic use, dealers, on the hire-purchase and deferred-payment systems, in furniture and other goods, &c. The subscribers are: R. L. Muxworthy, 258, Princes Avenue, N.W.9, and J. S. Sadler,, 36, Weald Way, London Road, Romford. Secretary: G. R. Lowe. Registered office: River Plate House, Finsbury Circus, E.C.2.

**S.T. Indicators, Ltd.**—Private company. Registered July 31st. Capital, £500. Objects: To carry on the business of seat indicator makers, electrical engineers and contractors, &c. The directors are: S. Thomas, 32, Melrose Avenue, N.W.2, and three others. Registered office: 31a, Cricklewood Broadway, N.W.2.

**James W. Thornes, Ltd.**—Private company. Registered July 31st. Capital, £5,000. Objects: To carry on the business of manufacturers of and dealers in wireless and television apparatus, electrical fittings, &c. The subscribers are: J. W. Thornes and Mrs. Winifred Thornes, both of Goatland House, Bennett Lane, Batley.

**Colman Auto Electrical Works, Ltd.**—Private company. Registered July 31st. Capital, £1,000. Objects: To acquire the business of an automobile electrical engineer carried on by K. B. Ferris at 26, Olive Street, Sunderland. The directors are: L. B. Ferris, "Brunton," Ridgeway, Kenton, Newcastle-on-Tyne, 3, and G. Stier, 28, Crowtree Road, Sunderland. Registered office: 26, Olive Street, Sunderland.

**Linbird Trading Co., Ltd.**—Private company. Registered July 24th. Capital, £100. Objects: To carry on the business of importers, exporters, factors, manufacturers, and dealers in electrical, gas, hydraulic and mechanical plant, cooking, heating, lighting, ventilating and refrigerating apparatus, &c. The directors are: W. J. Linbird, 10, Lancell Street, Stoke Newington, N.16; and M. O. Eerdmans, Sandridge Hotel, Carshalton Beeches, Surrey. Registered office: 150, Strand, W.C.2.

**Signmakers, Ltd.**—Private company. Registered July 19th. Capital, £500. Objects: To carry on the business of printers, stationers, manufacturers of and dealers in neon signs and signs generally, advertising agents and contractors, &c. The directors are: I. Himmelspring, 145, Upper Clapton Road, E.5, general merchant; and S. H. Limmer, 88, Ewell Park Way, Ewell, Surrey, sign maker.

**Electric Ignition (Southend), Ltd.**—Private company. Registered August 7th. Capital, £100. Objects: To carry on business as manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries, &c. The permanent directors are: D. C. Regan, 1, Richmond Court, Grand Parade, Leigh-on-Sea, and Mrs. D. A. Edwards, "Desmaril," Prittlewell Chase, Westcliff-on-Sea. Secretary: D. C. Regan. Registered office: Electric Garage, Electric Avenue, Westcliff-on-Sea.

## Returns of Electrical Companies

**Fraser & Howard, Ltd.**—H. Watson, of 66, Finsbury Pavement, E.C.2, was appointed receiver on July 27th, 1937, under powers contained in instruments dated May 17th, 1933.

**Folkestone Radio Works, Ltd.**—Satisfaction to the extent of £250, on June 30th, 1937, of series of debentures authorised by resolution dated March 26th, 1934, and registered June 27th, 1934, securing £700.

**Edison Bell (1933), Ltd.**—Satisfaction in full on July 19th, 1937, of debenture dated July 27th, 1936, and registered July 28th, 1936, securing £2,000.

**Monks & Byrne, Ltd.**—Capital, £2,500 in £1 shares. Return dated December 31st, 1936 (filed May 24th, 1937). 2,000 shares taken up. £1,350 paid. £650 considered as paid. Mortgages and charges, nil.

**Morris & Co. (Radio), Ltd.**—The nominal capital has been increased by the addition of £4,000 in £1 ordinary shares beyond the registered capital of £6,000.

**F. J. Baynes & Co., Ltd.**—Capital, £100 in 100 shares of £1. Return dated August 27th, 1936 (filed April 19th, 1937). All shares taken up. £100 paid. Mortgages and charges nil.

**Radio Hire Service, Ltd.**—Capital, £1,000 in £1 shares. Return dated December 31st, 1936 (filed March 13th, 1937). 120 shares taken up. £120 paid. Mortgages and charges: £454 9s. 7.

**E. H. Maisner & Co., Ltd.**—Capital, £1,000 in £1 shares. Return dated February 1st (filed April 21st), 1937. 495 shares taken up. £495 paid. Mortgages and charges nil.

**M. Partridge and Co., Ltd.**—Capital, £5,000 in 2,000 preference and 3,000 ordinary shares of £1. Return dated June 25th. 805 preference and 3,000 ordinary shares taken up. £2.505 paid. £1,300 considered as paid. Mortgages and charges, nil.

**Child's Electrical Stores, Ltd.**—Capital, £1,000 in £1 shares. Return dated June 9th. All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges, £502 15s.

**British Television Supplies, Ltd.**—Capital, £500 in £1 shares. Return dated October 30th, 1936 (filed May 19th, 1937). 56 shares taken up. £56 paid. Mortgages and charges, nil.

**Fullick & Loosley, Ltd.**—Capital, £1,000 in 400 ordinary and 600 preference shares of £1. Return dated June 24th. 400 ordinary and 80 preference shares taken up. £370 paid. £110 considered as paid. Mortgages and charges nil.

**Union Cable Co., Ltd.**—Capital, £100,000 in £1 shares. Return dated May 13th, 1937. All shares taken up. £100,000 paid. Mortgages and charges nil.

**Wycombe (Borough) Electric Light & Power Co., Ltd.**—Capital, £200,000 in 25,000 preference and 175,000 ordinary shares

of £1. Return dated April 23rd, 1937. 15,000 preference and 175,000 ordinary shares taken up. £172,000 paid on 15,000 preference and 157,000 ordinary shares, £18,000 considered as paid on 18,000 ordinary shares. Mortgages and charges nil.

**Chamberlain & Hookham, Ltd.**—Capital, £100,000 in 9,500 preference and 10,500 ordinary shares of £5. Return dated July 6th, 1937. 8,000 preference and 10,100 ordinary shares taken up. £36,990 paid on 100 ordinary and 7,298 preference shares, £53,510 considered as paid on 10,000 ordinary and 702 preference shares. Mortgages and charges nil.

**Luminous Signs, Ltd.**—Particulars filed of £1,700 debentures authorised July 7th, 1937, charged on the company's undertaking and assets, present and future, including uncalled capital, the amount of the present issue being £1,200.

**Britannia Switchgear & Electrical Equipment Co., Ltd.**—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated July 26th, 1937, to secure £1,500. Holders: Britannia Manufacturing Co., Ltd., 22-6, Britannia Street, City Road, N.1.

**"Agripta" Manufacturing Co., Ltd.**—Land registration charge on freehold properties in Bentinck Road, Yiewsley, Middlesex, dated July 15th, 1937, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd.

**Sterling Works (Dagenham), Ltd.**—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £150,000.

**Mevagissey Electric Supply Co., Ltd.**—Capital, £5,000 in 4,433 preference shares of £1 and 1,134 ordinary shares 10s. Return dated December 31st, 1936 (filed June 7th, 1937). All shares taken up. £336 15s. paid (2s. 6d. on 454 ordinary and £1 on 280 preference shares), £4,663 5s. considered as paid (£1 on 680 ordinary and 4,153 preference and 7s. 6d. on 454 ordinary shares). Mortgages and charges nil.

**Lighting Accessories, Co., Ltd.**—Capital £250 in £1 shares. Return dated May 20th, 1937. All shares taken up. £2 paid. £248 considered as paid. Mortgages and charges nil.

**Electricity Distribution of North Wales & District, Ltd.**—Capital, £400,000 in £1 shares. Return dated April 13th, 1937. All shares taken up. £411,087 10s. paid on 396,500 ordinary (including 1s. 6d. per share premium on 194,500 shares). £3,500 considered as paid on 3,500 ordinary shares. Mortgages and charges, £86,790.

**County of London Electric Supply Co., Ltd.**—Capital, £14,000,000 in £3,381,925 6 per cent. cumulative preference stock, £2,000,000 4 per cent. cumulative preference stock, £5,709,109 ordinary stock, and 118,075 6 per cent. cumulative preference, 1,000,000 4 per cent. cumulative preference, and 1,792,891 ordinary shares of £1. Return dated March 30th (filed June 14th), 1935. All stock taken up. £8,504,441 paid on £3,225,000 6 per cent. preference stock, £2,000,000 4 per cent. preference stock, and £3,279,441 ordinary stock. £2,584,593 considered as paid on £2,584,593 ordinary stock. Mortgages and charges, £8,000,000.

**Contraflo Engineering Co., Ltd.**—Capital, £43,725 in 50,000 shares of 16s. 6d. each. Return dated May 14th, 1937. All shares taken up. £43,725 considered as paid. Mortgages and charges, nil.

**Shanghai Electric Construction Co., Ltd.**—Capital, £700,000 in £1 shares. Return dated April 29th, 1937. 670,000 shares taken up. £417,000 paid. £253,000 considered as paid. Mortgages and charges, nil.

**Birkdale District Electric Supply Co., Ltd.**—Capital, £55,000 in £5 shares. Return dated May 14th, 1937. 10,200 shares taken up. £51,000 paid. Mortgages and charges, £25,504 15s. 11d.

**Peacock & Waller, Ltd.**—Capital, £2,000 in £1 shares. Return dated April 28th, 1937. 1,800 shares taken up. £1,800 paid. Mortgages and charges, nil.

**A. Berkeley, Ltd.**—Capital, £10,000 in £1 shares. Return dated May 14th, 1937. 7,800 shares taken up. £7,800 paid. Mortgages and charges, nil.

**L. E. Wilson & Co., Ltd.**—Capital, £2,000 in £1 shares. Return dated May 21st, 1937. 1,601 shares taken up. £1,601 paid. Mortgages and charges, nil.

**Streamline Radio, Ltd.**—Satisfaction to the extent of £19,000 on July 9th, 1937, of debentures authorised by resolutions of November 29th, 1934; January 14th, February 12th, August 19th, September 12th, September 23rd, October 7th, and November 7th, 1935; and March 5th, 1936, and registered March 17th, 1936.

**G. D. Peters & Co., Ltd.**—Satisfaction to the extent of £20,000, on July 30th, 1937, of second debenture dated December 12th, 1930, and registered December 22nd, 1930. (According to the register of mortgages, the second debenture registered December 22nd, 1930, originally secured £50,000.)

**Express Battery Co., Ltd.**—Capital, £600 in £1 shares. Return dated 31st, 1936 (filed June 2nd, 1937). All shares taken up. £600 paid. Mortgages and charges, nil.

**Harvey-Thompson Accumulator Service, Ltd.**—Capital, £5,000 in 8,000 ordinary shares of 2s. 6d., 4,000 10 per cent. preference shares of 5s., and 3,000 6 per cent. preference shares of £1. Return dated May 10th (filed July 6th), 1937. 8,000 ordinary, 4,000 10 per cent. preference and 2,010 6 per cent. preference shares taken up. £3,010 paid on the preference shares, £1,000 considered as paid on the ordinary shares. Mortgages and charges: £600.

**Mid-Cumberland Electricity Co., Ltd.**—Capital, £250,000 in £1 shares. Return dated June 7th, 1937. All shares taken up. £244,769 paid, £5,231 considered as paid. Mortgages and charges, nil.

**Westminster Tool & Electric Co., Ltd.**—The nominal capital has been increased by the addition of £12,000 beyond the registered capital of £8,000. The additional capital is divided into 2,000 5 per cent. cumulative preference, 3,000 ordinary and 7,000 as ordinary or preferred ordinary shares of £1 each.

**Yorkshire Copper Works, Ltd.**—The nominal capital has been increased by the addition of £100,000 beyond the registered capital of £400,000. The additional capital is divided into 63,060 5 per cent. second preference and 36,940 undenominated shares of £1 each.

**Peterhead Electricity Co., Ltd.**—Capital, £35,000 in £1 shares. Return dated May 3rd, 1937. 31,000 shares taken up. £31,000 paid. Mortgages and charges nil.

# City Notes

**Cables Investment Trust, Ltd.,** held its second annual meeting on Tuesday last, when Lord Pender (chairman), who presided, reviewed the accounts which covered for the first time a full year's working. He said that the capital remained unchanged and the capital reserve had been increased by profits on sales during the year. Debenture stock purchased and cancelled in accordance with the trust deed during the year to June 30th, 1937, amounted to £15,000. In addition, they had redeemed £100,000 during the year, which was available for re-issue. The fact that the valuation of securities held on June 30th last was in excess of their book value was cause for satisfaction in view of the considerable fall in the value of most securities during last year. The redemption of high yielding bonds had continued, and notice of the repayment of further bonds in the near future had been received.

**The Buell Combustion Co., Ltd.**—Following the reorganisation of the capital the directors now offer to shareholders at par 60,000 £1 6 per cent. cumulative convertible preference shares and £60,000 five-year non-interest bearing registered notes in multiples of £1. Finance is required for paying off existing loans and providing further funds to carry on the company's business and extend its activities. The amount advanced to the company by New Consolidated Gold Fields has been increased from £70,900 to £82,000.

**Gabriel, Wade & English, Ltd.,** report a net profit for the year ended May 31st, of £126,406, as compared with £77,745 for 1935-36. It is proposed to pay a dividend of 6 per cent., plus a bonus of 2 per cent., on the ordinary stock (against 5 per cent.), to place £50,000 to reserve, £20,000 to taxation reserve, and £8,000 to contingency reserve. The balance carried forward is £41,430 (against £41,877 brought in).

**Edmundsons Electricity Corporation, Ltd.,** reports that the results of the operations of its group of companies during July, as compared with the corresponding month of 1936, show an increase of 13 per cent. in kWh sold.

**The Craigpark Electric Cable Co.** reports a profit of £20,091 for 1936-37, as compared with £3,877 in the preceding year. A sum of £5,000 is allotted for depreciation, and £17,349 is carried forward, subject to directors' fees, as against £2,858 brought in.

**The Rheostatic Co., Ltd.,** states that the turnover for the six months to March 31st shows a considerable increase over the corresponding period of 1935-36 and in the last three months all previous records have been exceeded.

**The South Metropolitan Electric Light & Power Co.** has announced an interim ordinary dividend of 3 per cent., less tax (same).

**The National Gas & Oil Engine Co., Ltd.,** has announced an interim dividend of 2½ per cent. on the preference shares, less tax.

**Waste Heat & Gas Electrical Generating Stations, Ltd.,** is paying an interim dividend of 2½ per cent. on the ordinary stock (unchanged).

**The Folkestone Electricity Supply Co.** has declared an interim ordinary dividend of 4 per cent., tax free (unchanged).

**The Electrolux Corporation** has declared a quarterly dividend of 40 cents and an extra payment of 10 cents (unchanged).

**The Greengate & Irwell Rubber Co.** is paying an interim ordinary dividend of 9d. per share, less tax (same).

# Stocks and Shares

TUESDAY EVENING.

THE unexpected August interest in Stock Exchange markets is well maintained. Fortified by what House men call a "good week-end Press," the popular departments started this week on a strong note, with the volume of general business showing undeniable expansion. Money comes into the Stock Exchange in amounts unusually large for the time of year, when cash is more likely to be spent in holidays than in stocks and shares. The various industrial sections display unwonted activity. Shares in the electrical manufacturing and equipment group are in demand. Talk is rife of probably increased dividends. Even the rubber share market has begun to give signs of reviving energy. Business comes a trifle spasmodically; one day may be a good one, the next very quiet. On the whole, however, the volume of general activity keeps upon a higher level than is usual in August.

## Central Electricity Board Issues

In common with other gilt-edged securities the prices of Central Electricity Board stocks have experienced a fairly substantial fall since the beginning of this year. Quotations are from 3 to 7 points below their best levels. Nevertheless, the Central Electricity prices have lately been standing up better than many others in their particular group. The difference in yields, making allowance for redemption, between Government and C.E.B. stocks, is not in most cases more than a few shillings per cent. The latter's 3½ per cents. can be bought at 97½ to give a running yield of £3 11s. 10d. per cent. Allowing for repayment at 100, the return is a few pence higher. On War Loan 3½ per cent. stock, which is redeemable in "1952 or after," the return, either flat or to redemption, is slightly over 3½ per cent. Central Electricity 4½ per cents., dated 1951-73, at 109, yield £4 1s. 3d. per cent. flat, or exactly 3½ per cent. to redemption at the earlier date. The 5 per cents. of 1950-70 pay a running return of £4 7s. 9d. at 114 and £3 12s. 9d. per cent. to redemption.

## Electricity Supply Shares

The market in electricity supply issues took a good deal of interest in the statements made by the Electrical Distribution of Yorkshire and the Yorkshire Electric Power Co., in connection with Government intentions to implement the McGowan Committee's recommendations. Both companies express, in half-yearly progress reports, their willingness to discuss with other electricity supply concerns the question of further voluntary unification. The reports show, in each case, substantial increases in the amount of electricity sold during the period; interim dividends have been maintained at the same rate as last year's.

Little business is passing in electricity supply shares as a whole, however; the list of prices contains no quotable alterations of consequence. City Lights and County ordinary are better. Of the shares whose prices went ex dividend, on Monday in this week, the majority regained the deduction straight away. In the overseas section, Palestine Electric "A" shares rallied from 37s. 9d. to 38s. 9d., and Jerusalems to 27s. 9d. Atlas Electrics strengthened to 6s. 3d., East African Power to 30s., and Perak Hydros to 28s.

## Equipment and Manufacturing

Shares in the electrical equipment market continue to claim a good proportion of the more cheerful interest now displayed generally in industrial markets. General Electrics, at 86s., stand a further 2s. to the good on the week. The renewed popularity of cable manufacturing shares is evidenced by various rises. Siemens are $\frac{1}{8}$ up at 33s. 9d. A gain of 6d. to 20s. 6d. in Henleys was due to the influence of the encouraging interim dividend declaration. A feature is the strength of shares connected closely with telephone manufacturing, on evidence of growing activity in that section of industry. Ericssons jumped 5s. to 25s. 8d.; others in the group to move upwards were Hall Telephones, which put on 1s. 6d. to 28s. 6d., and Telephone Manufacturing, now 10s. 6d. Among shares not included in the list of share prices published weekly on this page, Switchgear and Cowans advanced from 19s. 3d. to 20s. 9d., and improvements were shown in Allen Wests at 6s. 3d., Crabtree Electricals 34s., and Westinghouse Brakes 69s. 9d. Reyrolles have jumped to 62s. and Lancashire Dynamo at 71s. 3d. are 3s. 9d. higher on the week. Enfield Rolling Mills at 20s. 6d. have put on half a crown.

## Conditions in America

Students of the graph system—and their names are many—observe with interest that the prices of American utility and industrial stocks have drawn well away from what is recognised as their normal relationship to quotations for American railroad shares. The reason, according to expert opinion, is not far to seek. President Roosevelt, the most highly placed of modern Socialists, admits the desirability of encouraging trade and industry, yet frames his policy in such shape as to be of small benefit to the railroads of the U.S.A. The latter must naturally draw advantage, sooner or later, from improving conditions in the American industrial circles, but increased earnings are threatened by possible rises in wages and by the advance in cost of materials. For the time being the President appears to have mollified the hardness of his attitude towards utilities, with resultant demand for the companies' shares by the American investor.

## "Emmies"

A lively recovery in radio and kindred share prices, following news of a rise in wireless set prices, testified to the investor's new-found readiness, given the necessary encouragement, to venture a little further into the speculative sphere. The market in Electrical and Musical Industries shares enjoyed what might pass, in these comparatively quiet days, for a burst of activity, which carried the price from 20s. 3d. up to 23s. Refrigerators are, if such a term may be used, another of the several irons in the "Emmies" fire: the hot weather has directed a good deal of inquiry into shares carrying a "refrigeration equity."

The announcement of the price increases referred to supplied a stiffening to the whole list of radio shares, which had been depreciating on fears of the effects of rising costs, added to the industry's other difficulties. E. K. Coles picked up from 14s. 6d. to 16s. 9d., McMichaels from 2s. 3d. to 2s. 9d. Others to improve were Pye deferred, now 14s. 9d., Philco 7s. 9d., and Ultra Electric 7s. 9d. Public interest in television remains, from the market point of view, rather mild, but Baird issues have lately picked up to 1s. 9d. for the preferred and 3s. for the deferred.

## Miscellaneous Matters

Brazilian Tractions retain their popularity and their resiliency. The rise this week is $\frac{3}{4}$ of a dollar. Mexican utility short bonds have weakened, on the extremely autocratic attitude adopted by the Mexican Government to the country's industrial undertakings. Mexican Light and Power are 4 down at 40¾. Iron, steel and engineering shares are strong. Babcock & Wilcox at 2½ show a rise of 1s. 9d.; Vickers have gone ahead to 32s. 6d. Marconi Marines advanced to 38s. 9d. on hopes that the 7½ per cent. dividend will be restored to the previously paid 10 per cent. The Cable and Wireless feature is a gain of 2½ points in the ordinary stock, raising it to 86. Globe Telegraph and Trust ordinary went up automatically to 16½.

# Share List of Electrical Companies

| | Nom. | Dividend. Previous. | Last. | Price Aug. 10. | Rise or Fall. | Yield p.c. £ s. d. |
|---|---|---|---|---|---|---|
| **HOME ELECTRICITY COMPANIES.** | | | | | | |
| Bournemouth and Poole | 1 | 15 | 15 | 67/6 | — | 4 9 0 |
| City of London | 1 | 7½ | 7½ | 34/- | +1/- | 4 8 3 |
| Clyde Valley | 1 | 7 | 8 | 39/- | — | 4 2 1 |
| County of London | 1 | 10½ | 10½ | 50/- | +6d. | 4 4 0 |
| Edmundson's 7% Pref. | 1 | 7 | 7 | 33/6 | — | 4 3 7 |
| Do. Ord. | 1 | 8 | 9 | 39/- | — | 4 12 4 |
| Elec. Dis. Yorkshire | 1 | 9 | 9 | 41/- | — | 4 7 10 |
| Elec. Fin. and Securities | 1 | 12½ | 12½ | 2 11/16 | — | 4 13 0 |
| Elec. Supply Corporation | 1 | 11 | 12 | 52/6 | +6d. | 4 11 5 |
| Lancs Light and Power | 1 | 7½ | 7½ | 34/- | — | 4 8 3 |
| Lond. Assoc. Electric | 1 | — | 7 | 31/3xd | +6d. | 4 9 6 |
| London Electric | 1 | 7 | 8 | 35/6xd | +6d. | 4 10 2 |
| London Power Deb. Red. | Stock | 5 | 5 | 106½ | — | 4 14 0 |
| Metropolitan | 1 | 10 | 10 | 46/-xd | +6d. | 4 7 0 |
| Midland Counties | 1 | 7½ | 8 | 36/6 | — | 4 7 8 |
| Mid. Elec. Power | 1 | 8 | 9 | 2 | — | 4 10 0 |
| North Eastern Electric Ordinary | 1 | 6 | 7 | 32/6 | — | 4 6 2 |
| Do. 7% Pref. | 1 | 7 | 7 | 34/6 | — | 4 1 2 |
| Northampton | 1 | 10 | 10 | 46/3xd | +9d. | 4 6 7 |
| Notting Hill 6% Pref. | 10 | 6 | 6 | 14 | — | 4 5 9 |
| North Met. Elec. Ordinary | 1 | 10 | 10 | 48/9 | — | 4 2 2 |
| Do. do. 6% Pref. | 1 | 6 | 6 | 30/6 | — | 3 18 8 |
| Scottish Power | 1 | 8 | 8 | 37/- | — | 4 6 8 |
| South London | 1 | 7 | 7 | 32/- | — | 4 7 6 |
| Whitehall Elec. Invst. 7½% Pref. | 1 | 7½ | 7½ | 23/- | — | 6 10 4 |
| Yorkshire Elec. | 1 | 8 | 8 | 39/-xd | +6d. | 4 2 1 |
| **PUBLIC BOARDS.** | | | | | | |
| Central Electricity, 1950–70 | Stock | 5 | 5 | 113 | — | 4 8 6 |
| Do. 1955–75 | „ | 5 | 5 | 116 | — | 4 6 2 |
| Do. 1951–73 | „ | 4½ | 4½ | 109 | — | 4 2 7 |
| Do. 1963–93 | „ | — | 3½ | 97½ | — | 3 11 10 |
| London Elec. Trans. Gtd. | „ | — | 2½ | 86 | — | 2 18 1 |
| London & Home Counties, 1955–75 | „ | 4½ | 4½ | 109 | — | 4 2 7 |
| London Passenger Transport, A | „ | — | 4½ | 115½ | — | 3 18 3 |
| Do. do. B | „ | — | 5 | 117½ | — | 4 5 1 |
| Do. do. C | „ | 4 | 4 | 82 | — | 4 17 9 |
| West Midlands Joint Elec. 1948–68 | „ | — | 5 | 111½ | — | 4 9 8 |
| **TELEGRAPH AND TELEPHONE.** | | | | | | |
| American Tel. & Tel. | $160 | 9 | 9 | 171½ | — | 5 5 0 |
| Anglo-Am. Tel. Pref. | Stock | 6 | 6 | 122 | — | 4 18 4 |
| Do. Def. | „ | 1½ | 1½ | 29½ | — | 5 1 8 |
| Cable & Wireless 5½% Pref. | „ | 4½ | 5½ | 107 | — | 5 2 9 |
| Do. Ord. | „ | — | — | 86 | +2½ | — |
| Do. Income | „ | — | — | 101½ | — | 3 18 10 |
| Globe Tel. & Tel. Ord. | 10 | 4½* | 5½* | 16½ | +½ | 3 8 3 |
| Do. do. Pref. | 10 | 6 | 6 | 14½ | — | 4 5 9 |
| Great Northern Tel. | 10 | 20 | 20 | 42 | — | 4 15 5 |
| Marconi-Marine | 1 | 10 | 7½ | 38/9 | +⅛ | 3 17 4 |
| Oriental Telephone Ord. | 1 | 12* | 12* | 3½ | — | 3 16 10 |
| **HOME AND FOREIGN TRAMS, ETC.** | | | | | | |
| Anglo-Arg. Trams First Pref. | 5 | Nil | Nil | 5/- | — | — |
| Do. do. 2nd Pref. | 5 | Nil | Nil | 3/9 | — | — |
| Do. do. 5% Deb. | Stock | Nil | Nil | 19½ | — | — |
| British Electric Traction Def. Ord. | „ | 5 | 5 | 1275 | — | — |
| Do. do. Pref. Ord. | „ | 8 | 8 | 168 | — | 4 15 5 |
| Brazil Traction | $100 | 40 cts. | 50 cts. | 28½ | — | — |
| Brit. Columbia Elec. Rly. Pfd. | Stock | 5 | 5 | 105½ | — | 4 14 9 |
| Mexican Light Common | $100 | Nil | Nil | 2 | — | — |
| Do. 1st Bonds | $500 | 5 | 5 | 40½ | −4 | — |
| Victoria Falls Ord. | 1 | 20 | 12 | 67/6 | — | 3 11 2 |
| West Riding | 1 | 6½ | 10 | 43/9 | — | 4 11 4 |
| **MANUFACTURING COMPANIES.** | | | | | | |
| Aron Electricity Ord. | 1 | 15 | 15 | 2½ | — | 6 0 0 |
| Assoc. Elec. Ord. | 1 | 8 | 10 | 49/6 | +6d. | 4 0 8 |
| Do. Pref. | 1 | 8 | 8 | 37/6 | — | 4 5 3 |
| Babcock & Wilcox | 1 | 8 | 10 | 50/- | +1/9 | 4 0 0 |
| British Aluminium Ord. | 1 | 7½ | 10 | 54/6 | +1/- | 3 13 4 |
| British Insulated Ord. | Stock | 20 | 20 | 5 | — | 4 0 0 |
| Brush Ord. | Stock | Nil | Nil | 49½ | — | — |
| Callender's | 1 | 15 | 15 | 4 11/16 | — | 3 2 3 |
| Do. 6½% Pref. | 1 | 6½ | 6½ | 30/- | — | 4 6 8 |
| Crompton Parkinson Ord. | 5/- | 12½ | 12½ | 57/6 | — | — |
| Do. 8% Pref. | 1 | 8 | 8 | 37/6 | — | 4 5 4 |
| Electric Construction | 1 | 7 | 10 | 2½ | — | 4 14 1 |
| Enfield Cable Ord. | 1 | 25 | 25 | 5 11/16xd | +1/6 | 4 8 0 |
| English Electric | 1 | Nil | Nil | 34/- | — | — |
| Do. do. Pref. | 1 | 6½ | 6½ | 26/6 | — | 4 18 1 |
| Ericsson Tel. | 5/- | 20 | 25 | 2 9/16 | — | 2 12 8 |
| Ever Ready | 5/- | 35 | 45 | 33/0 | −6d. | 6 16 6 |
| Ferranti Pref. | 1 | 7 | 7 | 27/6 | — | 5 1 10 |
| G.E.C. Pref. | 1 | 6½ | 6½ | 32/6 | — | 4 0 0 |
| Do. Ord. | 1 | 15 | 17½ | 86/- | +2/- | 4 1 4 |
| Henley's | 5/- | 30 | 15 | 20/6 | +6d. | 3 13 2 |
| Do. 4½% Pref. | 1 | 4½ | 4½ | 1½xd | +6d. | 4 0 0 |
| India-Rubber Pref. | 1 | 5½ | 5½ | 22/6 | — | 4 17 0 |
| Johnson & Phillips | 1 | 7½ | 10 | 47/- | — | 4 5 1 |
| Lancashire Dynamo | 1 | 10 | 20 | 3 3/16 | + 3/16 | 5 12 4 |
| Siemens Ord. | 1 | 6 | 7½ | 33/9 | + 1/16 | 4 19 0 |
| Telegraph Construction | £1 | Nil | 7½ | 2½xd | +9d. | 2 17 2 |

* Dividends are paid free of Income Tax

# Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

**1935**

34127. "Headlamps for vehicles." A. H. Bailey. December 10th, 1935. (468782.)

34207. "High-voltage transformer for television apparatus." Radioakt.-Ges. D. S. Loewe. December 12th, 1934. (468891.)

34217. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd., and N. M. Rust. December 10th, 1935. (468784.)

34393. "Electrical controlling device for grinding and abrading machines." C. E. Every-Clayton. (Wotan-und Zimmermannwerke Akt.-Ges.) December 11th, 1935. (469009.)

34619. "Electric-arc convertors." General Electric Co., Ltd., and H. H. Taylour. December 13th, 1935. (469010.)

34662. "Radio or like carrier-wave receivers." Marconi's Wireless Telegraph Co., Ltd., and G. M. Wright. December 13th, 1935. (468834.)

**1936**

836. "Electro-magnetic wave receiving-circuit control devices." V. H. Cove and B. Flyn. January 10th, 1936. (468788.)

903. "Wireless and like receivers." J. Robinson. January 10th, 1936. (469077.)

994. "Mechanical and electrical couplings." A. F. W. Richards and H. Bright. January 11th, 1936. (Addition to 442140.) (Cognate application 16489/36.) (468835.)

1012. "Moving-coil electrical measuring and like instruments." Elliott Bros. (London), Ltd., and D. C. Harben. January 11th, 1936. (468790.)

1024. "Telephone systems." Automatic Electric Co., Ltd., and R. Taylor. January 11th, 1936. (468792.)

1060. "Television and like systems." Baird Television, Ltd., and G. E. G. Graham. January 13th, 1936. (468837.)

1110. "Electrical apparatus comprising main and reserve sources of supply for a load." Westinghouse Brake & Signal Co., Ltd. September 28th, 1935. (468843.)

1120. "Automatic switches as used in telephone systems." Automatic Electric Co., Ltd., and R. N. Saxby. January 13th, 1936. (468844.)

1126. "Frequency-control electrical transmission lines." Marconi's Wireless Telegraph Co., Ltd. January 12th, 1935. (468846.)

1140. "Electrical switch-fuse combinations." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. January 14th, 1936. (468894.)

1142. "Fuse-holders for use in connection with electric fuses of the replaceable cartridge type." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. January 14th, 1936. (468895.)

1143. "Electrical switches of the oscillatory-contact type." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. January 14th, 1936. (Addition to 429178.) (468793.)

1181. "Generation of mechanical waves of supersonic frequency." Scophony, Ltd., and J. H. Jeffree. January 14th, 1936. (469018.)

1203. "Electric room-heater." Burndept, Ltd., and R. P. Richardson. January 14th, 1936. (468849.)

1315. "Methods of modulating carrier-waves." Fernseh Akt.-Ges. January 15th, 1935. (468959.)

1349. "Television and like systems." H. G. Lubszynski. January 15th, 1936. (468965.)

1350. "Electron-discharge devices comprising photo-electrically active electrodes." H. G. Lubszynski and G. S. P. Freeman. January 15th, 1936. (469079.)

1443. "Electrical instruments for transmitting and/or reproducing angular movements." Bendix Aviation Corporation. January 17th, 1935. (469026.)

1448. "Electrical statistical apparatus peculiarly suitable for use with telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. January 16th, 1936. (468968.)

1459. "Electric clocks or clock movements." British Sangamo Co., Ltd., and F. R. Butherus. January 16th, 1936. (469029.)

1483. "Electron-discharge devices suitable for use in television and like systems." H. G. Lubszynski. January 16th, 1936. (469033.)

1604. "Carrier-frequency amplifier for use with photo-electric cells." Radioakt.-Ges. D. S. Loewe. January 18th, 1935. (469085.)

1658. "Means for attaching flexible conductors to electric plug-and-socket coupling devices." H. Davies, E. A. Taylor and Belling & Lee, Ltd. January 18th, 1936. (468970.)

2401. "Electric fuses of the cartridge type." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. January 25th, 1936. (468973.)

2431. "Electro-magnetic relays." B. Piesker and W. Goy. January 25th, 1935. (468974.)

2574. "Cathode-ray tubes and apparatus embodying the same." Farnsworth Television Inc. February 6th, 1935. (468795.)

2793. "Circuits for wireless-receiving apparatus." Milnes Radio Co., Ltd., and H. R. Milnes. January 30th, 1936. (468796.)

3300. "Electrical socket couplings or socket outlets and switch-socket combinations." J. A. Crabtree and Co., Ltd., and H. F. McLoughlin. February 4th, 1936. (468797.)

3333. "Means for controlling the supply of alternating current to electric welding apparatus." English Electric Co., Ltd., and T. A. Long. February 4th, 1936. (469045.)

3342. "Electric dynamometers." British Thomson-Houston Co., Ltd., and A. A. Polleck. February 4th, 1936. (468859.)

3979. "Self-starting synchronous motors." R. A. Lochner and P. A. H. Mossay. February 10th, 1936. (469046.)

6266. "Copying-telegraph system." Farnsworth Television Inc. March 27th, 1935. (468864.)

6942. "Electric motor control systems." Electrical Apparatus Co., Ltd., and R. H. Barbour. March 7th, 1936. (469053.)

8146. "Electrically controlled signalling installations for railway block sections with single-track sections." Vereinigte Eisenbahn-Signal-Werke Ges. September 28th, 1935. (Addition to 35456/35.) (468804.)

8755. "Portable electric battery lamps." J. Downs. March 24th, 1936. (468981.)

8764. "Sources of infra-red radiation." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) March 24th, 1936. (468805.)

10961. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., and J. A. V. Fairbrother. April 16th, 1936. (468982.)

11276. "Plug-and-socket couplings." Breeze Corporation, Inc. May 8th, 1935. (468806.)

12537. "Contacts for electric switches." General Electric Co., Ltd., and J. Eriksen. May 4th, 1936. (468987.)

12698. "Electric motors." British Thomson-Houston Co., Ltd., and A. H. Maggs. May 5th, 1936. ((468871.)

13749. "Television receivers." Radioakt-Ges. D. S. Loewe. May 16th, 1935. (468808.)

14021. "Television transmitter." Radioakt.-Ges. D. S. Loewe May 18th, 1935. (468809.)

17010. "Liquid-break electric switches." British Thomson-Houston Co., Ltd. June 19th, 1935. (468876.)

17822. "Type-printing telegraph and like machines." Creed and Co., Ltd., and R. D. Salmon. January 13th, 1936. (Divided out of 1080/36.) (468878.)

19646. "Electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) July 15th, 1936. (Addition to 432320.) (468814.)

20389. "Electric contact devices." J. G. Smithson. July 23rd, 1936. (Addition to 401057.) (468904.)

21451. "Level-maintenance for television amplifiers." Radioakt-Ges. D. S. Loewe. August 5th, 1935. (468905.)

22860. "Construction and assembly of structures for use in meters, relays, indicating devices, and the like." Allgemeine Elektricitats-Ges. August 22nd, 1935. (468907.)

22941. "Protective arrangements for convertor systems comprising cross-connected electric-discharge devices." Siemens-Schuckerswerke Akt.-Ges. August 20th, 1935. (468908.)

25998. "Reduction of interference in electric signal transmission systems." W. S. Percival. November 8th, 1935. (Divided out of 30991/35.) (468994.)

28401. "Electric radiation furnaces." Soc. Anon des Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny and Cirey. October 19th, 1935. (468997.)

29819. "Electrical cooking apparatus." A. Walterspiel. November 2nd, 1936. (468998.)

30301. "Fusible electric cut-outs." British Thompson-Houston Co., Ltd., November 8th, 1935. (468916.)

30920. "Terminal boxes for communication electric cables." Siemens and Halske Akt.-Ges. November 12th, 1935. (468917.)

31623. "Apparatus of the radio-compass type." Bronzavia Soc. Anon. November 18th, 1935. (468918.)

32392. "Starting circuit for gas or vapour-filled electric-discharge devices." Vanovia Chemical and Manufacturing Co. May 23rd, 1936. (468822.)

33693. "Attenuation equalisers for electric transmission and like systems." Standard Telephones and Cables, Ltd. January 30th, 1936. (469067.)

**1937**

2210. "Split-anode magnetrons." C. Lorenz Akt.-Ges. January 24th, 1936. (468825.)

4222. "Electric motors." British Thomson-Houston Co., Ltd. February 14th, 1936. (468826.)

4267. "Stators for alternating-current machines." Siemens-Schuckertwerke Akt.-Ges. February 12th, 1936. (468827.)

5256. "Electrical instruments for transmitting and/or reproducing angular movements." Bendix Aviation Corporation. January 17th, 1935. (Divided out of 469026.) (469071.)

6073. "Electric switches with self-generated arc-extinguishing gas-blast. British Thomson-Houston Co., Ltd. February 28th, 1936. (469006.)

6228. "Fusion-welded articles and a method of making the same." Babcock and Wilcox, Ltd. May 9th, 1936. (469074.)

6473. "Carrier-wave transmission systems." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 7th, 1936. (469075.)

# Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 4th.

Sparton. No. 574051. Class 8. Thermionic valves and radio receiving sets and radio-gramophones, not being battery operated.—The Sparks-Withington Co., Jackson, Mich., U.S.A. (British representatives, Gee & Co., 21-22, Chancery Lane, W.C.2.).

Design only. Nos. 575728 and 575732. Classes 13 and 50. Signs, lamp standards, &c., of ordinary metal or of wood or in which wood predominates.—O. C. Hawkes, Ltd., Globe Works, Bromsgrove Street, Birmingham.

## Properties of "Wonderstone"

A bulletin recently issued by the Geological Survey Division of South Africa discusses a peculiar stone which is obtained from the Lichtenburg district of the Transvaal. It has been named "Wonderstone" and is said to exist in very large quantities, being probably a metamorphosed clay derived from volcanic ash. It is softer than ordinary slate and does not tend to cleave into or split off in thin flakes. Its bluish-grey colour remains uniform through great thicknesses. The material is easily cut and drilled in its natural state, and a good surface finish is easily obtainable. Possible electrical uses are for making switchboard panels and insulating supports for variable resistances.

# New Work for Contractors

**Particulars of new works and building schemes for the use of electrical installation contractors and traders**

*Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Audenshaw.**—Houses (41), Snipe estate; McLellan and Abel, builders, Audenshaw Park.

**Barking.**—Houses (58), London Road and Union Street site; C. C. Shaw, architect, Town Hall, Barking. Houses (33), Manor Farm estate; Leftley Bros., Ltd., Longbridge Road. Extensions to factory, for Sanders and Forster, Ltd., Hertford Road.

**Barrow-in-Furness.**—Houses (90), Black Butts Lane; J. Parkinson & Sons, Ltd. Houses (230) and shops, Rating estate; borough engineer.

**Batley.**—Houses, Dark Lane and Grange Road; G. L. Hall, borough surveyor.

**Bilston.**—Houses (46), Moseley Road, St. Chad's (£14,490): A. Greensill, builder, Earl Street, Coseley.

**Birmingham.**—Block of shops, College Road, Kingstanding; Broomhead & Green, builders, 220, Kingstanding Road, Birmingham. Regional Haadquarters, for the British Broadcasting Corporation, at the corner of Frederick Street and Islington Row.

**Bishop Auckland.**—Houses; North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne.

**Blackburn.**—Extensions to works, St. Ives Road; Bancroft & Co., Intack.

**Bolton.**—Extensions to works, Holland Street; Phillipson & Co., Ltd.

**Bridlington.**—Dwellings (94), near St. John Street and Marton Road (£33,180); Jaques and Greeves, Ltd., builders.

**Brierley Hill.**—Houses (20), Enville Road estate, Wall Heath; R. H. J. Comber, U.D.C. surveyor, Albion Street, Brierley Hill.

**Bristol.**—Alterations and additions to Ham Green and Southmead hospitals (£100,343); city engineer, Bristol.

**Castle Bromwich.**—Cinema, Old Chester Road; H. Dare, Copt Heath, Solihull.

**Croydon.**—Houses (86), Davidson Road (£33,388); Truett & Cox (Surrey), Ltd., builders, North Cheam. Drill hall, etc., Mitcham Road Barracks, for the Surrey Territorial Army and A.F.A. (£20,428); Wilson Bros., builders, Lessington Avenue, London, S.W.17.

**Devizes.**—Houses (48), Forty Acres; borough surveyor.

**Ellesmere Port.**—Cinema for the directors of the Prince of Wales Cinema, Clayton Square, Liverpool, 1; Gray Evans & Crossley, architects, 51, North John Street, Liverpool. Offices, power house and buildings, Stanlow, for the National Benzole Co., Ltd., Wellington House, Buckingham Gate, London, S.W.1.

**Glasgow.**—Cinema, Warriston Street; Cochran, Stout & Dunlop. Factory and offices, Alexandra Parade; Imperial Tobacco Co., Ltd.

**Gravesend.**—Furniture showrooms, Windmill Street; R. Nelson & Co.

**Grays** (ESSEX).—Cinema, including café-restaurant, for the Union Cinemas, Ltd., Union House, Regent Street, S.W.1; F. Bernhard, managing director.

**Great Barr** (BIRMINGHAM).—Houses, Queslett Road, for the First National Housing Trust, Ltd.; Henry Boot & Sons, Ltd., builders, 10, The Boltons, London, S.W.10.

**Hampshire.**—School, Cowplain, near Cosham, for C.C.; A. L. Roberts, county architect, the Castle, Winchester.

**Harrogate.**—Houses, Roberts Crescent, Bilton; T. Robson, builder, Harrogate.

**Hull.**—Flats and shops, William Street, and three schools; city architect.

**Ilford.**—Houses (60), Havering Gardens; J. T. Perrin, 279, Hampton Road. Houses, Merton Road, Morden Road and Walden Way; G. F. Seigerts, 2, Oakfield House, Oakfield Road.

**Irish Free State** (LIMERICK).—School, George's Quay, for City Vocational E.C.; M. Doyle & Sons, builders, Limerick.

**Lanark.**—Houses (134), West Maddersmains and St. Catherine's Croft, with electrical work; J. H. Fraser Stewart, architect, 38, High Street, Lanark.

**Lancaster.**—Houses (100), Hare Runs, for the Corporation Health Committee. Houses (48), Whernside and Ingleborough Road; Fairhopes Estates, Ltd.

**Leeds.**—Operating theatre, electrical and massage dept., etc., St. James's Hospital; Kitson Parish Ledgard and Pyman, architects, Lloyds Bank Chambers, Vicar Lane, Leeds, 1.

**Lincolnshire.**—Additions to Spalding Grammar school, Spalding (£30,000); C. Smith, county architect.

**Liverpool.**—Police training school and mounted police headquarters and residences, Allerton; surveyor, Municipal Buildings.

**London** (STOKE NEWINGTON).—Redevelopment of old town hall site for library, &c. (£20,500); borough engineer.

**Luton.**—Extensions to works for Vauxhall Motors, Ltd.

**Maidenhead.**—Municipal offices and Council chamber (£40,000); borough surveyor, Guildhall.

**Manchester.**—Houses (57), Herristone Road and Chudleigh Road, Crumpsall, for W. J. Davies, "Riversdale," Princes Parkway, Didsbury; Roberts, Wood and Elder, architects, 26, King Street. Houses (48), Moston Lane and Tyndall Avenue, Moston; Broadhurst Park Estate, Ltd., 25, Cross Street. Houses New Bank Street, Kirkmanshulme Lane and Newton Avenue, Longsight, for Booth & Sons, 14, Holmleigh Avenue, Blackley; Broughton Atkinson & Eagle & Son, architects, 37, Brown Street. Houses, Thorn Street and Pine Street, Gorton, for F. Annable & Sons, 73, Hyde Road, Gorton; H. Davies, architect, 4, St. Mary's Parsonage.

**Mansfield.**—Bus depot, Chesterfield Road; East Midland Motor Services, Ltd.

**Mexborough.**—Additions to printing works, High Street, for the Times Printing Co., Ltd.; D. W. Harrop, architect, Bank Street.

**Middlesbrough.**—Houses and shops, Acklam Road, for B. Day; Kitching & Co., architects, 21, Albert Road. Fire station (£35,582); borough engineer. Additions to stores, Clifton Street, for the Middlesbrough Co-operative Society; C.W.S. architects' department, 90, Westmorland Road, Newcastle-on-Tyne.

**Monmouthshire.**—Alterations and improvements of Pontypool County school (£18,676), for County E.C.; W. & A. Davies, builders, Abersychan.

**Morecambe.**—Houses (36), Brendjean Road; A. Whitehead. Fire station (£15,250); Edmondson Bros., Ltd.

**Nailsworth** (GLOUCESTERSHIRE).—Houses (30), Tynings Farm; W. E. Beard, builder, Stroud.

**Norfolk.**—School, Upwell (£18,407), for County E.C.; H. C. Greengrass & Sons, Ltd., builders, Norwich.

**Norham.**—Houses, Hornclifffe; Gray & Paterson, architects, 11, Castlegate, Berwick-on-Tweed.

**Nottingham.**—Houses (308), Broxtown Lane estate; E. Philips, architect, Exchange Buildings East, Nottingham.

**Perthshire.**—School and schoolhouse, Almondbank for Perthshire and Kinross County Council; A. Watt Allison, architect, County Offices, Perth.

**Poole.**—School, Wimborne Road (£41,690), for E.C.; Hawkins Bros., Ltd., builders, Winton, Bournemouth.

**Prudhoe-on-Tyne.**—Houses; U.D.C. surveyor.

**Richmond** (YORKSHIRE).—Houses (56), on site adjoining Reeth Road; borough surveyor, Corporation Offices, Frenchgate.

**Ripon.**—Houses, Alma estate; city architect.

**Rochester.**—Factory, Temple estate, for J. H. Sankey & Son, Ltd.,Aldwych House, London, W.C.2.

**Ross-on-Wye.**—Houses (56), Three Crosses site; F. C. Davoil, architect, Gloucester Road.

**Rugby.**—Houses (80), Parkfield Road, Newbold (£29,926); St. George's Building Works, builders, Erith.

**Scarborough.**—Houses, between St. James's Road and Avenue Road, for Mrs. M. Bouch; Jones & Rickaby, architects, 102, Westborough.

**Scunthorpe.**—Houses (66), Crosby estate (£25,938); Green & Mackender, builders, Ashby.

**Sheffield.**—Houses (24), Audrey Road; J. H. Judge & Co., Ltd. Houses, Blackstock Road; Newhouses (Builders), Ltd. Cinema and shops, Crookes Road; H. J. Shepherd. Flats (48), Duke Street (£32,221); W. Malthouse, Ltd.

**Southall.**—Extensions to works, Windmill Lane; Associated Equipment Co., Ltd.

**Southport.**—Cinema, Wellington Road; Associated British Cinemas, Ltd.

**Stanmore** (MIDDLESEX).—Houses (62), Old Church Lane; John Laing & Son, Ltd., builders, Mill Hill, London, N.W.7.

**Stoke-on-Trent.**—Schools, Cornhill and Buckhall, for City E.C.

**Stourbridge.**—Houses (122), Hungary Hill site; borough surveyor, Municipal Offices.

**Surrey.**—Central laundry, Morden (£85,750); county architect.

**Tiverton** (DEVONSHIRE).—Factory and warehouse, for John Heathcoat & Co.; H. S. W. Stone, architect, Lloyds Bank Chambers, Taunton.

**Tredegar.**—Houses (30); W. Edgar Jones, surveyor, Council Offices.

**Warwickshire.**—Schools, Hartshill and Lode Lane, Solihull, for County E.C.

**Whitley Bay.**—Houses (80), Hartley West End; U.D.C. surveyor.

**Whitwood Mere** (CASTLEFORD).—Houses (58), Cutsyke Hill; F. Schofield, clerk, Whitwood Mere.

**Wigston.**—Houses (44), Manor Street; G. F. Stacey, U.D.C. surveyor, Council Offices, Wigston.

**Wolverhampton.**—Houses (100), Moreton estate, Marsh Lane; E. A. Colman. Houses (20) and shops, Old Heath Road: M. A. Boswell. Cinema, Fallings Park, for R. Satchwell, Birmingham, and enlargement of Springfield school (£28,768); H. J. Amies & Sons, Ltd., builders, Melbourne Street, Wolverhampton. Enlargement of Borough hospital (£56,710); borough engineer.

**Worcestershire.**—School, Grange Lane, Stourbridge, for C.C.; director of education, County Buildings, Worcester.

**Worthing.**—Houses (22), Crowborough Drive; Chatsmore estates. Houses, Field Place estate; Yates, Cook & Darbyshire.

## An American Water-heating Award

The *Electrical World* reports that thirty-eight utility companies from all sections of the United States have registered in a competition for an award of $1,000 and a silver trophy offered by the National Electric Water Heater Council through the Edison Electric Institute. The winner of the award will be announced at the annual convention of the Institute next year. Mr. C. E. Greenwood, commercial director of the Edison Electric Institute, states that the entries represent approximately 30 per cent. of the 120 utility companies in the country that offer water-heating rates at 1½ cents or less. The award will be given to the utility company whose work and co-operative efforts show the greatest contribution to the development of the domestic water-heating load through planning, promotion or selling during 1937. It is stated that the award is on a different basis from other honorary awards, in that both large and small utility companies may enter with equal opportunity to win. Major consideration will be given to the utility company whose water-heating plan is most original and whose execution of the plan is most effective.